American Machinist

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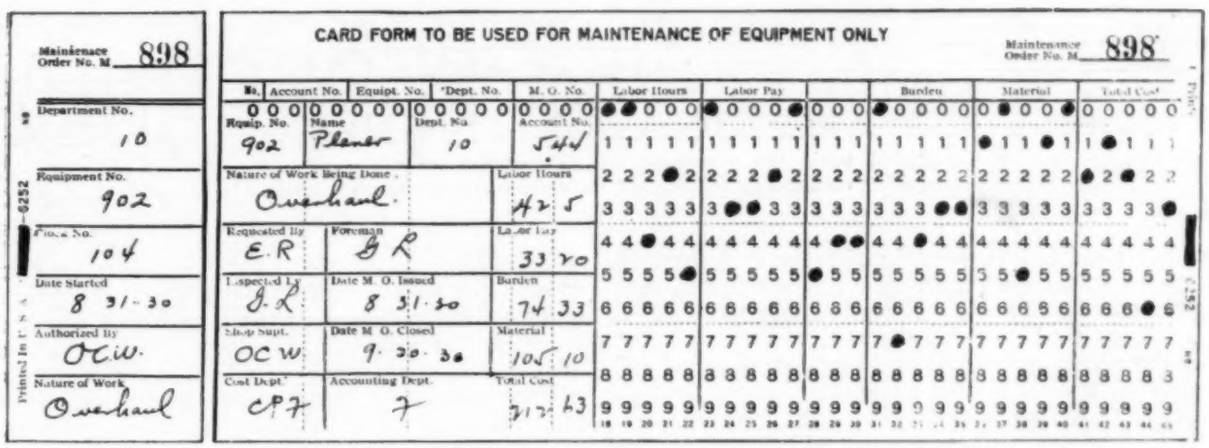


Maintenance Order No. M 898

CARD FORM TO BE USED FOR MAINTENANCE OF EQUIPMENT ONLY

Maintenance Order No. M 898

Department No. 10
Equipment No. 902
Piece No. 104
Date Started 8-31-30
Authorized By O.C.W.
Nature of Work Overhaul

No.	Account No.	Equipt. No.	Dept. No.	M. O. No.	Labor Hours	Labor Pay		Burden	Material	Total Cost
Equip. No. 902	Name Planer		Dept. No. 10	Account No. 544						
Nature of Work Being Done: Overhaul.				Labor Hours 42 5						
Requested By E.R	Foreman E.R			Labor Pay 33 70						
Inspected By J.L	Date M. O. Issued 8 31 30			Burden 74 33						
Shop Supt. O.C.W.	Date M. O. Closed 9 30 30			Material 105 10						
Cost Dept. CP7	Accounting Dept. 7			Total Cost 213 43						

Without relinquishing control, good management has cut red tape on urgent work by use of the Maintenance Order Card

Cutting the Cost of Cost Keeping

THOMAS B. FRANK
Treasurer, Cincinnati Planer Company

Another effective way for executives to save time and cold cash. Maintenance and depreciation records are set up to render maximum service at minimum expense

IMPERATIVE necessity compels business executives to seek new methods of handling daily office routine. The elimination of all frills and duplication of effort is more than a goal to seek; it is a business necessity. There is no excuse for the many and varied records one finds in the average office. Certain information is recorded, the source of the original information is passed on to another department for another recording, and then possibly again turned over for a third listing. The original record of information should be so designed that it may become the final and only record. This saves time, reduces filing space requirements, simplifies records and the procedure required to maintain those records. The resulting decrease in office expense is obvious, while the opportunity for error is practically eliminated. A survey of the records in use in most offices will certainly indicate where profitable changes may be made.

The keeping of maintenance and depreciation records has proven an irksome job and one that necessitates a considerable amount of clerical time, producing results more or less questionable. If such records are to be kept properly, they should be readily available for the use of management in the function of control, as well as for the information necessary in the accounting departments. No record warrants its existence unless it is used. To be useful, it must be absolutely accurate and up to date. Records of maintenance particularly have not been so kept, as they are usually made a subsidiary record instead of the main controlling record. This is likewise true of depreciation records.

For a long time, we had difficulty in getting the shop to give the office dependable information regarding shop maintenance. This was caused no doubt by the methods employed which involved some of the familiar red tape.

FORM T-

MAINTENANCE ORDERS DEPARTMENTAL ANALYSIS

Month of June 19 31

DEPARTMENT NAME	DEPT. NO.	ACCOUNT NO. 544				ACCOUNT NO. 545				ACCOUNT NO. 547				ACCOUNT NO. 549			
		HOURS	PAY	BURDEN	MATERIAL	HOURS	PAY	BURDEN	MATERIAL	HOURS	PAY	BURDEN	MATERIAL	HOURS	PAY	BURDEN	MATERIAL
General Shop	1	5 0	3.00	2.50	1.00	9	68	40									
Engineering	2									3 0	2.10	1.30	2.22				
Raw Stock	4									5 0	3.50		.50				
Finished Stock	5													2 0	1.00	1.40	3.25
Tool Room	6	10 0	5.00	10.00		20. 0	25.00	19.00	6.00								
Millwright	7																
Blacksmith	8																
Shipping	9																
Planer	10	27.0	31.00	63.00	23.30	10 0	6.00	4.00	3.00								
Engine Lathe	11																
Milling Machine	12																

Period totals are segregated on an analysis sheet from figures quickly obtained by running the cards through a tabulating machine

The orders had to be approved and properly authorized, and as a result, considerable time was lost before such approval was forthcoming. When breakdowns occurred, the tendency developed for the men to go ahead and make the necessary repairs without authorization, and charge their time to blanket expense accounts. This of course, might be sanctioned under some circumstances, but at its best, it was not productive of information that management could use in making decisions regarding the replacement of equipment and other uses that are made of maintenance data.

In an effort to gain control of all maintenance work, and at the same time, to provide a record that would answer all purposes, we devised what we have termed our "Maintenance Order Card." It is set up as shown in Fig. 1 and is used with automatic tabulating equipment. The use of this form has simplified our accounting work and the general handling of the orders for maintenance, both in the shop and the office. The desired information is maintained easily and kept up to the minute in permanent form always available for use by the departments affected.

As maintenance work is required, the foreman or the workman fills out one of these cards, indicating thereon the equipment number of the machine or unit that is to be repaired, the name, and the department number indicating its location. The account number to which charges are to be distributed, is also entered, and of course, the nature of the work to be done. The card is dated and initialed by the person making it out. This then is considered as sufficient authority for starting the work. It is required that the foreman and shop superintendent also initial the cards at their first opportunity so that they may be acquainted with all maintenance work being done. This procedure eliminates any occasion for interruptions and confusion resulting when shop executives are called away from other jobs to approve of starting maintenance work.

Frequent Checking

The stub of the card is filled out, and the time-keeper detaches it from the card and files it at the time station. This file becomes the record of orders issued. These stubs are checked frequently to make sure that all completed orders are turned in promptly.

The Maintenance Order Card is therefore the original order. It is serially numbered, and time is charged to the order number indicated on regular job time cards. Requisitions for materials are also charged to the order number just as charges are made to other shop orders.

Upon completion of the maintenance work, the order is closed and sent to the cost department for figuring. The regular job time cards and requisitions are figured first and then tabulated on the tabulating machine. Where tabulating equipment is not used, the same procedure may be followed except cards will not be punched but will be sorted and added by hand. The totals for labor hours, labor pay, burden, material cost, and total cost are then posted to the proper spaces on the Maintenance Order Card. This order card is then punched as indicated by the written information and filed away until the end of the accounting period.

Segregating Charges

At the close of the period, the cards are tabulated, and the totals entered upon the "Maintenance Orders Departmental Analysis," shown in Fig. 2. This segregates the various charges by different account numbers, and the totals of the columns on this sheet become the entries to the ledger accounts of expense.

After completion of the accounting entries, the maintenance order cards are filed in a closed file, sorted, and indexed by equipment numbers. This furnishes a complete file of all maintenance charges for any given piece of equipment for any given period. The file is then the permanent record of all maintenance. At the end of a year, when a number of cards have accumulated under any equipment number, they are removed, tabulated, and the grand total of all the cards transferred to one new card. This method keeps the file in a handy form for quick reference. The simplicity of handling makes the record valuable, to say nothing of other advantages its use may dictate.

The simplicity with which all cards may be tabulated and presented in summary form makes such a record really usable to the executive charged with shop responsibility. The departmental analysis shows him at a glance just what departments have incurred maintenance expense, and also what class of maintenance has been done, as indicated by the account number columns. In some

cases, the departmental analysis is broken down into equipment number charges which enables the shop manager to see what machine or other unit has been responsible for the expense.

It will be seen from the foregoing procedure, that the original order becomes the final and only record of individual equipment maintenance. It eliminates old time methods of posting each item of maintenance to an equipment record sheet or card. The cards must be handled currently as the regular books of account cannot be closed until this information is tabulated and passed on to the accounting department on the departmental analysis form. Thus it also serves the purpose of enforcing promptness in computing maintenance costs.

Errors Eliminated

A description of the equipment and depreciation record will also show how the same method is employed to simplify the handling of these records, and to make the periodic entries for depreciation charges and the recording of changes in the equipment accounts more accurate. By its use, most of the common errors, encountered when using old forms of equipment records, are eliminated.

Formerly, it was a common error to depreciate a given piece of equipment beyond the 100 per cent point, when the value of the individual equipment items were buried in the "Machinery" account. Our new method provides for a separate card for every item in the plant. It provides for the recording of exact depreciation data as well as data pertaining to the original cost of the equipment and its present-day reproductive value. This record is shown in Fig. 3 and is the form devised for use in the uniform system of accounting sponsored by the National Machine Tool Builders' Association. We have found its use effective in the proper accounting for our plant facilities and the depreciation thereon.

The following is an explanation of the card form and how it is used. It is to be noted that spaces are provided on the card for all information that is usually kept on property records, with the addition of information relating to the present-day values as indicated, "Reproduction Value." In the first space is recorded the date, April 20, 1920, that work is completed in the plant incident to the receiving and installation of a new machine, the laying of foundations, wiring, and the making of special attachments, and fixtures. These costs, $1,800 in this instance, are next recorded. To this is added a profit of $130 which represents the amount that would be added as a profit had the attachments and fixtures made been sold. This gives a total of $1,930 as a cost of all work done in the plant.

Next follows the date of purchase of the new equipment, the voucher number, and amount of purchase. To this is added the freight which gives the total outside purchase price of $12,675. The total cost of installation, and other work done in the plant is added to the total outside purchase price, and the total shown below in the amount of $14,605. Beneath that amount is shown the monthly depreciation amount and rate at which it is computed, which in the illustration is 10 per cent. Opposite these figures is the current price or reproduction value of the equipment, $16,795.75, and the corresponding monthly depreciation amount and the rate. Spaces are also provided on the card for the equipment number, its departmental location, and account number where charges are accumulated. The plant building location is also shown. The month and year of retirement is indicated and is based on the expected life of the machine as reflected in the rate of the charge for depreciation.

When tabulating equipment is used, all this information is punched into the cards in the columns indicated. When punched, the cards are easily tabulated and the totals of asset values and the monthly depreciation amounts easily ascertained.

When new items of equipment are installed in the plant, cards are filled out and inserted in the proper classifications in the files. When equipment is removed from the plant, the cards are removed from the file, closing entries made on the general books, and the cards filed in a closed file for future reference. When the expected life of an asset has expired as indicated by the retirement date, that card is removed from the open file and placed in a separate file until such a time as the equipment is actually disposed of. In many cases, equipment is used for many months after its expected and predetermined demise. This file of cards will properly record the value of all such items of equipment and the depreciation amounts that are continued as charges to costs until the item is actually removed.

Total Charge to Costs

It has been determined as expedient in the machinery industry to charge costs of production with depreciation based on the reproductive value of all assets. The total charge to costs is therefore determined by the monthly tabulation of the depreciation amounts shown on the cards under the reproductive value amounts.

Financial records and records for income tax purposes must be kept strictly on the original cost basis. The depreciation charge for each month on that basis, is obtained by the addition of the depreciation amounts

PRODUCED: DATE 4-20-20; PROD. ORDER 3771; COST VALUE 12000 00; COST 12000 00; PROFIT 130 00; TOTAL 1930 00

PURCHASED: DATE 4-15-20; VOUCHER 42371; AMOUNT 12500 00; FREIGHT 175 00; TOTAL 12675 00

TOTAL COST 14605 00; REPROD. VALUE 16795 75

DEP: AMOUNT 121 70; RATE 10%; AMOUNT 139 96; RATE 10%

DATE ACQUIRED 4-15-20; SOUND VALUE; COST DEPRECIAT'N; REPRODUCTION VALUE

PLANT RECORD

VOL. 1; PAGE 48; LINE 4

DESCRIPTION: 4-10" Th. Hydro. PLANER 42 x 46 x 16

REPROD. DEP.	MACH. NO.	DEP.	CL.	BLD.	RETIRE NO.	RETIRE YR.

MACH. NO. 986; DEPT. 10; CLASS ASSET 184; LOCATED BUILDING 1; RETIRE NO. 4; RETIRE YR. 30

NMTBA IBM 12396

Both cost value and reproduction value are shown on the Depreciation Record Card which also lists the retirement date

based on original cost as shown on the cards. The total of the cards each month, or at the close of any accounting period, should agree with the ledger accounts representing the value of such equipment, after all changes have been made for additions and removals.

For the purpose of aiding in the verification of monthly depreciation charges as well as for effecting a means of furnishing information for executive purposes, a report may be made from the tabulated information by classes of assets, department locations, and other classifications as the management desires, and which may be needed for the proper recording of information upon the books of account. This report shows the total cost at original cost figures for each classification and the corresponding depreciation on that value. It also shows the reproduction value and its depreciation, by the same classification. This makes for ready comparison and analysis should it be desired. The differences in the bases of valuation and the depreciation may also be shown and the comparison of the figures used as a measure of the cost of using equipment which cost more or less than present-day costs to reproduce that property.

Many pieces of equipment included in asset accounts may not carry the same rate of depreciation as other items. Some machines carry a 10 per cent rate, others are to be depreciated at only 6 per cent, while still others may have an expected life of only five years and be depreciated at 20 per cent. In the manner outlined above, it is an easy matter properly to account for all depreciation without the necessity of making separate classifications of the assets carrying the different rates of depreciation. The common error of using the wrong balance of a book account, upon which to compute the depreciation charge, has been entirely eliminated and the procedure is practically fool-proof.

Accuracy and Simplicity

This plan has proven its worth in assuring accuracy and simplicity in handling. It actually cuts down the time required to perform the various computations, and at the same time, provides a record that is at once available for many uses in the function of management.

The combination of the files of maintenance records and the property and depreciation records may in some cases be desirable. However, to provide for the monthly tabulation of the depreciation amounts and the making up of reports, it is better to keep separate files of maintenance records. These files may be arranged for immediate use and comparison by having the files of maintenance order and the equipment and depreciation records parallel each other. Each file should be classified and indexed in a similar manner that will assure ready reference at all times.

It is hardly necessary to dwell upon the necessity of keeping records of maintenance and depreciation other than to reiterate that such records are vital and important to the effective control of any business. Property represents so many dollars of investment, and it is just as important to control the property dollar as the dollar in the bank or in securities. The cost of keeping up the property is likewise important to control. The methods herein described provide an accurate and effective means of accounting for all property expenditures. The records are simple in their make-up, and considerable clerical effort is eliminated in their handling. The original records are made to serve several purposes, thus meeting the demand for better records at less cost.

A New Billet for the Precision Engineer

HARRY SHAW
Consulting Engineer
Heywood, England

The precision engineer may yet find a billet in textile engineering. A firm in England is developing a machine for weighing wool to within a fraction of a dram. The purpose of this accuracy is to enable a large number of small quantities of wool to be weighed, compressed into separate layers, the several layers packed together, and the final package still be within a small amount of the desired weight.

While more expensive than the old method of packing in one mass, the reduction in the size of the packages for the same weight of wool cheapens handling costs, and so makes the new method cheaper in the long run.

When the correct amount of wool has entered the weighing pan, the pan tips, causing the wool to drop onto a conveyor leading to the baling press. The wool has to be loaded uniformly into the pan, otherwise the weighing would be faulty.

Thousandths are again found cheaper than inches!

Making Springs with a Cutting Torch

AT THE Nürnburg Works of Siemens-Schuckert, an unusual method of making flat springs from steel tubing is employed. The work is chucked in a small lathe, and the cutting torch is mounted on the crossfeed of the machine. The machine lead spindle may then be set for the desired pitch, the table feed lever engaged, and the spring cut by turning the chuck by hand. Extra heavy thickness springs are made from forged tubing.

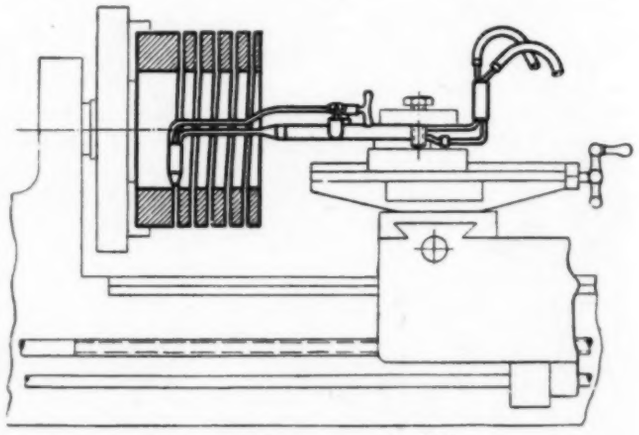


Fig. 1—The set-up in the lathe

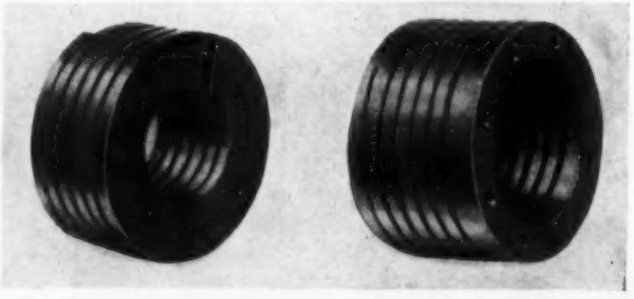
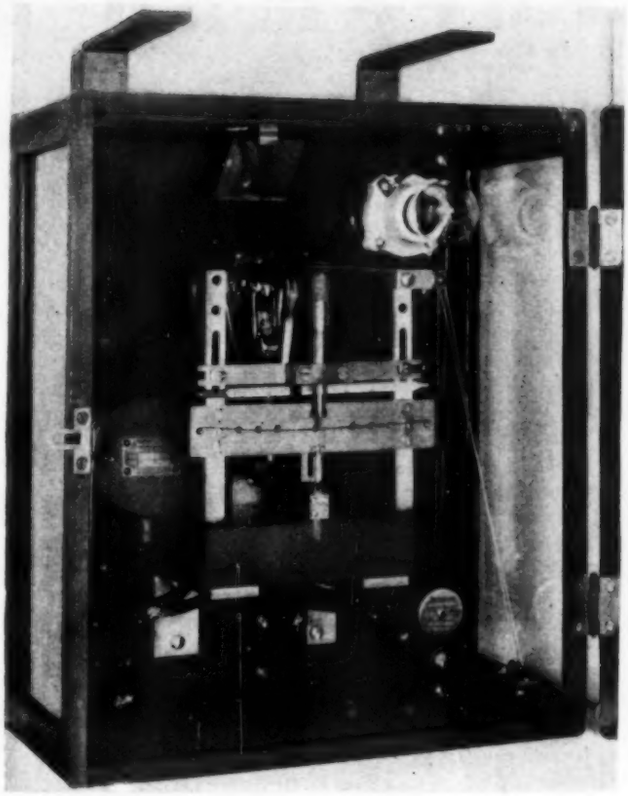


Fig. 2—Two springs made by this means, one an open-end, the other a closed-end



Grid Glow Micrometer

Again the vacuum tube has been pressed into service —this time to measure ductile and plastic materials

R. W. CARSON
Westinghouse Electric & Manufacturing Company

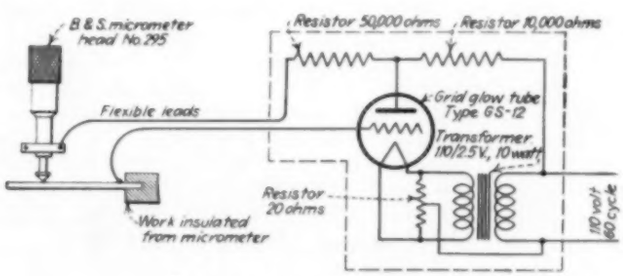
THE hand micrometer is the measuring instrument generally used for quick and accurate measurement of small dimensions. For measuring the thickness of metal sheets, the diameter of rods, or the dimension of metal pieces of rectangular section, the hand micrometer is reliable to 0.0005 in. However, when measuring the diameter of fine wire, or for close readings of plastic or very ductile material, the process of measuring may deform the piece between the anvils of the micrometer. In this case the sense of touch is not sufficiently sensitive for exact readings because the material being measured has to build up resistance to the micrometer screw in order to be felt, and this compression may permanently change the dimension being measured. When the distance being measured is between two parallel flat surfaces the unit pressure on the work may be too small permanently to affect the piece, but when measuring the diameter of, for instance, very small annealed copper wire the micrometer is almost certain to squeeze the wire before the operator's sense of touch indicates contact.

In connection with the measurements of the deflections of a small ribbon of phosphor bronze loaded as a beam, it was necessary to eliminate any contact pressure of the measuring device. These tests were in connection with a study of the "set" or "afterworking" characteristics of material used for instrument springs. The total effect to be measured did not change greater than 0.001 to 0.002 in., and because of the very small section of the ribbon any contact pressure would cause a deflection large enough to affect the accuracy of the test.

There are several commonly used optical systems of sufficient accuracy, but they were found to be too expensive and too difficult to keep in proper adjustment. Vibration would be extremely hard to control, because of the bulk and weight of the usual optical system. Also it would be very difficult to obtain the range required and still retain sufficient sensitivity. An electrical system of indicating instant of contact between the micrometer anvil and the center of the ribbon was tried. A copper contact cap was fitted over the spindle end of the micrometer, and the contact between the cap and the insulated ribbon lighted a low-voltage lamp. This worked for a few times while the contacts were clean, but arcing soon increased the resistance of the contacts until some pressure was required to give an indication. When a higher voltage circuit was used, electrostatic attraction drew the ribbon against the contact.

Successful measurements of the elastic "afterworking" were finally made by using a grid glow tube. The contact between a needle point attached to the micrometer and the insulated ribbon was arranged to close the control circuit of a relay using a Westinghouse hot cathode GS-12 grid glow tube. The tube gave off a bright red glow with a control circuit resistance as high as one megohm. At the instant of the first metal-to-metal contact between the needle point and the ribbon the contact resistance would be considerably lower than a megohm, and the tube would glow.

The grid glow micrometer was sensitive to smaller measurements than could be read on the barrel of the micrometer. A strong light was thrown on the micrometer, and the enlarged image of the barrel was projected on a ground glass screen. Divisions marked off on the screen made it possible to read the micrometer directly in ten-thousandths of an inch and estimate accurately to the nearest half ten-thousandth. Repeated readings checked within the readable accuracy, and no contact pressure was found. There was no pitting or sparking at the contacts visible under a microscope.


B & S. micrometer head No. 295
Resistor 50,000 ohms
Resistor 10,000 ohms
Flexible leads
Grid glow tube Type GS-12
Transformer 110/2.5 V., 10 watt
Resistor 20 ohms
Work insulated from micrometer
110 volt 60 cycle

The Foreman's Round Table

Run-of-Mine

"SAY, AL, wouldn't you think that with all the men wanting jobs, you would be able to get a good one once in a while?"

"Don't we?"

"You know we don't. I figured that, as we started to increase, I would be careful and pick better men. I hire three and find two of them are no good."

"You are lucky. You got one out of three. Why didn't you pick better ones. You sure had plenty to pick from, and the personnel office let you do your own picking."

"That's the heck of it, I did. And I picked the three best men that applied in a week. I wasn't in any hurry. I wanted good men. The trouble is that we don't pay a high enough rate to attract a good class of men."

"Bunk. No matter what the rate, the same men would apply. You'd pick out the same ones —and get fooled just as often. We can't expect to get a good grade of men in the factory. We've got to take what we can get."

"Yeah? I've heard that same argument before, but it don't convince me any more now than it did the first time I heard it. We don't even get run-of-mine stuff."

"Well, we haven't any right to expect even average men. The average kid, when he leaves school for a job, looks for a mercantile or an office one. The mechanics he has seen are all dirty and working hard. Not for him. He goes into a store or a movie theater or maybe he sells insurance or bonds. No sir, the average man doesn't apply for shop work. The average man is not mechanically inclined."

"Still, we've got some mighty good men in our shop, Al. How do you account for that?"

"Sure we have. No one said that good men never apply. They do, but how many have we got. You can count them on your fingers and toes. Those few we have got represent an accumulation of twenty years. Maybe one in 500 that have passed through the shop."

"Well, don't that prove just what I claim, that the rate is not high enough to attract a good class of men?"

"No, it don't. It only proves that the better class of men are not attracted by shop work. Look at the men in any clerical department. They are always superior to men getting anywhere near the same rate out in the shop—at least they act that way."

"Yes, and why? They give the office man a higher rate than he's worth, throw in shorter hours and a vacation, and it attracts a good class of men."

"Your grandmother! It takes one type of man for the shop and another for clerical or mercantile work. As far as personal characteristics go, there is little difference, but one is of the physical, the other of the mental type."

"What's the answer? You know so much."

"The answer is, Ed, that we've got to use the men we get. There is an economic law that says the skill necessary to operate a machine is inversely as the skill built into its mechanism, and—"

"What does that mean when it's untangled?"

"It means, Ed, that we have tool designers to build fool-proof tools, time study men to tell them feeds and speeds, and safety engineers to watch their fingers. It means also that skill can be transferred into a system or a method the same way. Even the ease of executing an order depends upon the intelligence and skill put into it. Finally it means, Ed, that it's up to you and me to furnish the skill that isn't built into our men."

Suggested by A. W. Forbes, Forbes & Myers, Electrical Manufacturers.

Aside from tool makers and really skilled mechanics, is the shop worker below the average of other occupations? Has there been any improvement in the class of people during the last decade?

Discussion of Former Topics

Advice, Gratis

Before Al and Ed find too much fault with the boys for not taking their advice, I would suggest that they carefully examine the advice and see that it is good. The prevailing tendency is to advise every boy to aim for the top and to work for it. There is proably more harm done by this kind of advice than there is by keeping boys below the level of their ability.

For example I knew one quite attractive boy of low ability. In this connection it might be well to mention that many of the most likable people come close to the border line of mental defectives. This boy was advised to learn the machinist trade, and unfortunately for him he conscientiously followed the advice. I tried him for a short time, and on seeing that he could not learn this trade I advised him to stop trying to, but the other advice was much stronger. The result was that after about five years at the trade, his discouragement was quite apparent. How much better it would have been if he had been a successful laborer.

Ed is probably wrong in thinking the country boys he mentioned are "smart as whips." In the East, at least, country boys are quite generally inferior to city boys in ability, though the superior training received in the country makes them appear far brighter than they are. The country boy usually comes to the employer with his abilities fully developed, so that little further improvement can be obtained. But the city boy comes with latent abilities that can be brought out by training.

From what I have seen of boys, I am convinced that in the great majority of cases, ability and ambition go together. When a boy rebels against his school studies it is because the studies are not suited to him. It is a wholesome reaction against well meaning abuse on the part of the educators. When the boy neglects the advice that is intended to help him to advance to higher positions, it is usually because he is not by nature fitted for those positions. To follow the advice would be to lose congenial work only to make a failure of something else. We need boys to promote to the more responsible positions in the shop, but the correct method is not to try to push boys ahead of where nature intended them. The proper way is to induce boys of superior ability to come to the shop in the first place. Then there will be no difficulty in directing them to the top.

—A. W. Forbes,
Forbes & Myers.

Signing Off

In writing purchase requisitions and okaying time allowance slips, store-room requisitions and quit slips, the foreman's mind should be clear on the major points at issue and not tied down by red tape methods of signing the different slips.

This idea of requiring an executive to use ink on certain forms and colored pencil on other forms is loading detail onto the executive which does not help those who would be using the forms later; and when management attempts to lay down such fine-drawn and exacting rules it adds details on which an executive should not be required to spend thought.

In shops where foremen still have authority to make out requisitions the foreman should not be bothered with routine signing.

—C. F. Staples.

Slowing Down

To the everyday executive the statement that a larger proportion of his men than usual are "soldiering" is not news. Wholesale outside unemployment always has the effect on the employed workman of inspiring a belief that he may be working himself out of a job. Then, if ever, is the time the shop foreman must be alert.

Where cost sheets show a gain instead of a decrease, a few quiet words to the workman responsible is all that is necessary; the foreman who runs around measuring the depth of cut is both wasting time and losing the respect of his men.

From my own experience, the slowing-down process seldom affects the piece worker whose rates are properly set, because a decrease in production means a lower standard of living than he has accustomed himself to.

—Robert S. Alexander.

Who Pays the Bills?

In balancing one system against another, due consideration must be given to the frequent loss of expensive tools, in addition to the adaptability of any particular system. The single-check system is not as good as the double-check system. With the former a workman can turn in ten tools or the equivalent, the possibility being that the tools are not his or some he may have borrowed. Consequently, Dan Mason can evade liability, which is impossible with the double-check system.

Owing to a long period of employment at the same plant, the old hands in both small and large plants are in possession of a goodly assortment of tools, brought about, perhaps, through outside social contact with the crib and its administrative staff, and the rule whereby certain tools are to be returned to the crib at the end of each week, is waived. A double-check system cannot entirely eliminate this, but by retaining certain features of this system and introducing a written order by the man desiring the tool, the checks permanently remain in the stores.

The procedure in obtaining tools is as follows: The man enters in a space provided on the order the nature or symbol of the tool, his number and name. The crib tender stamps the date and also enters the location of the tool. The order is suitably filed with the remaining checks, one of which is substituted for the tool. In returning the tool to the crib, the man receives the order back.

Any system must prove its effectiveness in operation. Its survival cannot be tolerated if it fails to check the loss of tools. It is essential that a tool be as easily located in the shop as in the crib. The double-check system apparently functions in this respect, but the check on a set of taps, for instance, gives no indication

as to how long the taps have been out in the shop. If the check has been on the taps possibly for months, it is questionable if they are still in existence, the crib tender is cleared as he can claim they have only been out a week. A system that takes care of the periodical return of tools, also minimizes the frequent loss of tools which takes place when employees leave.

—C. TALBOT, *London, England.*

Taking a Gamble

At first glance it might appear that chances are against Joe, and that he will be classified as a dissatisfied worker, but I think not. The firm advertised for a man dissatisfied with his present position, although the ad may not have said so in words. There are many men who make it a point never to ask for an advance, and if it does not come voluntarily, they have no alternative but to seek elsewhere. There are, of course, exceptions to every rule, but generally speaking a man is like a bicycle, which retains balance as long as it keeps moving, but falls as soon as it stops.

I believe the average company would welcome such applications from their employees. Progressive firms appreciate progressive men, and realize that regressive men are of no use either to themselves or their employers. —ALFRED C. LAYZELL.

Pitiless Publicity

Publicity, if a disinterested and fair statement of facts, is one of the most valuable forces in modern life. Unfortunatly, publicity has to to be bought and is usually, therefore, neither disinterested nor a plain statement of facts. It is as capable of doing harm as good. However, there is no reason why the facts of the efficiency or inefficiency of a department should not be stated in a quite unbiased manner. In my opinion this can do nothing but good.

I well recollect a huge indicator which hung from the roof of a shop where several hundred men were employed. They were paid on a group piece-work system with a bonus for the reduction of scrap below a certain percentage. This indicator showed the total loss of wages for the whole department for the week up to the time of setting, and the average for the same time for the previous quarter. This form of publicity was found to be effective in raising the efficiency for several years. It was only discontinued when the methods of manufacture were entirely changed. In another factory, manufacturing food products, the management was keen on the elimination of all foreign matter from its products. Here was introduced a system of giving credit to those finding foreign matter and blame to the departments responsible for letting it get in. Again it was found effective even though this scheme depended solely on publicity for its effectiveness, as no monetary rewards were given. —H. J. BURNHAM, *Birmingham, England.*

Rules is Rules

The man who has no initiative or intelligence should not be given employment in a machine shop.

Williams' notice on consistency in following orders, although somewhat of a contradiction, will operate satisfactorily in any shop where loyalty among all concerned is a dominant feature—in other words, a successful shop.

Many managers and foremen have been cursed with the type of man who always obeys orders. He boasts to everyone around that he has got a drawing or something else that contains a mistake, then goes ahead and joyfully awaits the fun to follow, knowing he cannot be discharged for obeying rules and orders. In such cases the new rule of Williams might act as a deterrent.

Men who work to rule are valuable, but the most successful are those who think intelligently for the firm which employs them and will disobey or query rules and orders at the right time. —F. P. TERRY, *Belfast, Ireland.*

Service De Luxe

The preponderance of the operations in our shops are on some sort of a rated basis, piecework, task and bonus, or what-have-you. Some men are so made that they will aggressively go after every possible chance to enhance their earnings. Others, who may be every bit as honest in their desire to give a full day's service, are so constituted that they follow whatever routine is laid down and must depend on whatever stimulation there may be in that routine for any increase in output.

A real pieceworker will get into the plant at the earliest possible moment to line up his work for maximum output, and will have it in such shape when he quits that he can pick it up quickly the following day.

I have seen men coming, of their own accord, into the shop as early as 5:30 in the morning in order to get set for production starting at 7 o'clock, whereas others, even with such examples around them, either are indifferent to the possibilities of personal initiative or are incapable of individual planning.

This being the case, and assuming that in any shop there will be men of these respective classes, there is not the slightest doubt in my mind but that a definite gain in production will result from any plan which makes available the facilities necessary to put in the full quota of regular working hours on production.

—D. C. WRIGHT, *Works Manager, Graver Tank & Mfg. Corporation.*

Advice, Gratis

The only people I ever knew who get tired of advice are the ones who are most in need of it. Naturally, a lot depends on the method of offering advice, whether it is offered in a helpful manner or in a condescending know-it-all manner. I hope the time never comes when competent men refrain from offering advice where it is needed, whether or not it is acceptable, for if only one in a hundred follows the advice given, it is worth the effort. If in offering advice, the advisor is one who is considered a "square shooter." I do not think there is much danger of its not being received gratefully. I have found in the majority of cases where men complain that it does not pay to give advice, the trouble lay entirely with the advisor. One case in particular was of an executive in a plant where I once worked. He made it a practice to advise the men to study to better themselves. Yet he had a reputation of never giving positions in the plant, when they were open, to his own men, but went outside for his executives and supervisors. How in the name of common sense could anyone expect men to follow advice from a person of that sort.

—CHARLES R. WHITEHOUSE, *Standards Engineer, The Holtzer-Cabot Electric Company.*

Individual cylindrical molds, motor-driven reamer and chuck used for fin removal, arbor press for opening molds, and molding presses for making instrument bases

Precision in Phenolic Molding

HERBERT CHASE
Consulting Engineer

Extreme care in the whole process, complete curing and adequate seasoning minimize subsequent warpage and dimensional changes

BASES, cases, and many supplementary parts of a large variety of instruments made by the Weston Electrical Instrument Corporation are molded from Bakelite. Since the accuracy of the instruments might be impaired if any of these parts should warp or change in dimension, it is essential that precautions against such defects be taken. Long experience and extreme care have developed remarkable precision in the company's molding practice.

With minor exceptions, the molding machines employed are conventional. They are connected to an accumulator that maintains a line pressure of 2,000 per sq.in. All heating is done with steam at 150 lb. per sq.in.

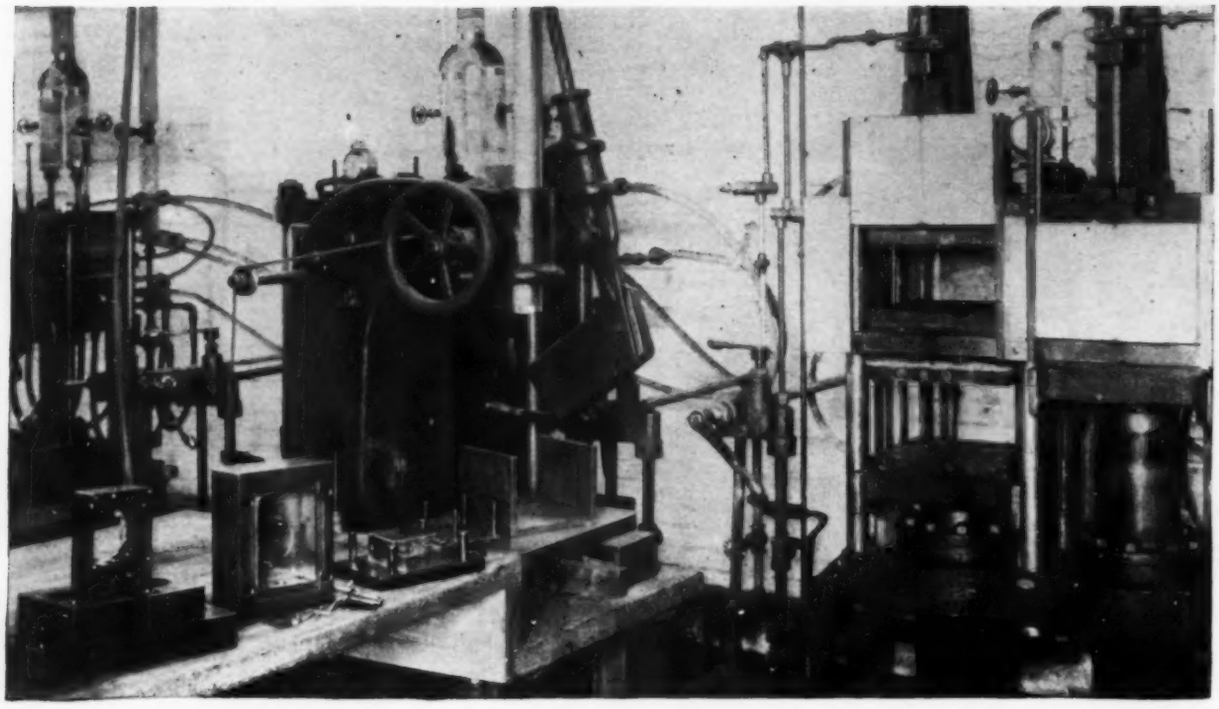
Mold designs vary to suit a variety of conditions, but are always such that a temperature of at least 300 deg. F. is maintained in the cavity, which is frequently checked by a thermocouple. Molding is done at a minimum pressure of 3,000 lb. per sq.in. and in exceptional cases at pressures as high as 9,000 lb. per sq.in., partly to assure a fine finish free from the grained or "pinskin" appearance that is likely to occur at pressures around 2,000 lb., usually employed in molding phenolic resinoids.

Curing time naturally varies with the size and section thickness of the piece, but averages around 4 min. after the die is closed. Curing for 8 to 10 min. is not unusual on heavy pieces. At the end of curing, pieces are not removed at once from the mold, however, as this is one of the most likely causes of warpage and subsequent change in size. Instead, the mold is cooled while still under pressure, being transferred to the cool side of the press, unless cored and connected for cooling by water.

After pieces are removed from the mold and the fins are trimmed off, they are transferred in quantity to an oven and are given at least an overnight (14-hour) bake at a temperature of 200 deg. F. For certain pieces, this seasoning is continued for as much as 72 hours. Thorough curing and seasoning has the added advantage of materially increasing the dielectric strength of the material.

Because of the comparatively long time cycle in the press, the production per press-day is not so high as general molding practices averages. This longer press time, however, is the price that must be paid to obtain molded pieces suitable for electrical assemblies where permanence and high dielectric strength are essential. Molded pieces can be made in a much shorter press time without any sacrifice in general appearance, but they will not possess those characteristics which are vital to stability and good instrument performance.

This lower press production is offset to some extent by a fairly high man-hour production considering the character of the work done. The higher man-hour rate was brought about through careful time studies and by laying out work so that the operator is constantly kept busy filling and handling molds, placing inserts in position, clearing fins from pieces and performing other essential operations. Parts are produced on a piece-work basis, but must conform to prescribed standards and pass



One man operates the duplex press which has both hot sides insulated to conserve heat. The doors open hydraulically

careful inspection. Curing and cooling times are specified for each piece, and are timed accurately by individual alarm clocks set for each operation.

As a rule, operators must handle several molds, sometimes as many as twenty, depending upon production requirements, so that one set of molds is curing, one cooling and one filling. Many of the presses are duplex types, both sides of which are handled by one operator.

Types of Molds

The type and design of molds is varied to meet a considerable variety of conditions. When the production is comparatively small or the part to be molded is likely to change in design, overflow or flash molds generally are used because the cost, including tool steel employed, is less. Positive or semi-positive molds are used when the production required is greater or when higher precision than is possible with a flash mold is necessary. In the latter case, and especially when the piece is circular and of fairly good size, instead of making multiple-cavity molds, two or more single-cavity molds, each with its own "force" or plunger, are employed. Such molds often consist merely of a short straight cylinder with a properly formed, close-fitting grooved plunger, the open end of the cylinder being closed by a flat plate.

Molds of this type, although requiring somewhat more handling of parts than multiple-cavity molds, cost less to make, are easily repaired in units without tieing up production on other cavities, and are lighter to handle. They also make it easy to place inserts or pins around the circumference and at right angles to the main axis. Another advantage is that if production requirements exceed expectations additional cavities can be added as required and at small expense.

A third class of mold employed is that designed for semi-automatic machines of either the vertical or tilting type. These are positive molds, cored for steam-heating and water-cooling, and are arranged to eject the piece or pieces when opened. They are used only for pieces produced in considerable quantity, as their cost is high.

A large proportion of Weston molds require inserts, often as many as twenty or more per piece. Generally these inserts are either tapped or threaded, and frequently they have to be screwed onto pins to keep threads free from the plastic. When the design permits and no extra complication in the mold is involved, the inserts are arranged to project above the surface, so that they can be recessed into the mold. Then threads do not have to be protected and breakage of pins and displacement of inserts through surging of the charge is avoided. Many inserts that have to be flush with a molded surface are provided with a beveled flange at the surface into which they are countersunk. This flange helps to support the pin and thereby to prevent pin breakage.

It frequently happens that molds used for the case or base of one instrument can be employed for another similar instrument having, for example, a different arrangement of terminals or face opening. In this event the mold is designed so that different parts can be inserted to effect the difference in the pieces formed. It is customary also, where mere differences in drilling are involved, to center-spot for all holes that may have to be drilled, so that it is a simple matter to drill any of the holes needed in a given instrument, in correct location.

Finishing

With minor exceptions, all parts that are produced in the molding department leave it completely finished and ready for assembly into the instruments for which they are designed. In every case, all fins and sharp edges are removed by filing, reaming, drilling, or tumbling, usually by the molder who produces the part, thus enabling him to utilize time that otherwise might be wasted while parts are curing or cooling. Parts of cases that would reflect light if left polished as they come from molds are given a matte or "grain" finish on a soft-

muslin polishing wheel treated with a composition of pumice and oil. This wheel gives best results at a surface speed of 1,800 ft. a min.

Most parts are molded from black Bakelite of the grade known as AY1733, but other grades and colors are used where greater strength or some other special consideration demands.

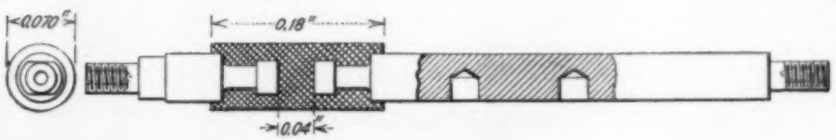
Some typical examples of the work done are given in accompanying illustrations. One of these, the base for the Model 301 instrument, is made up in individual, cylindrical, semi-positive molds handled in groups of six at a time. There are three inserts in each piece, which is about 3 in. in diameter. One man molds and finishes about 42 pieces an hour on a Watson-Stillman press having an 8-in. ram. After removing pieces from the molds, the operator forces the plungers into their out position against a stop (using an arbor press), cleans the molds, puts inserts in place, fills the molds with powder, and puts them into the press. During the cure he slips each of the pieces already molded into a chuck on the end of small motor shaft, there removing the fin and sharp edge with a file. He then reams two holes in each piece, using a small drill press. Curing time in this mold is 6 min. and the cooling time 1 min.

An example of work on a semi-automatic inverted press is that done on a Model 1 instrument base, which measures about 6 by 9 in., embodies fairly thick sections, and has eighteen inserts. The cure requires 8 min., and water cooling, 3 min., the production rate being about 3½ pieces per hour. The mold remains in the press, but of course must be cleaned carefully between each molding. During the cure the operator hand-files fins and sharp edges, removes loose insert-holding pins and prepares inserts for quick insertion prior to the next molding.

Cases for the Model 301 meter require no inserts. They are molded, three at a time, in six separate, single-cavity molds at the rate of about 20 pieces per hour. Three molds are cooled and reloaded while the other three are curing. The operator withdraws and re-inserts three pins that form small holes in the cylindrical side walls of the case. He also removes fins with hand tools, and in addition has time to weigh out the charge for each mold. An arbor press is used to force plungers to their outer position. Curing requires 7 min., cooling 2 min.

Molding of cases for the Model 264 instrument, which measures about 6x8 in. and has eighteen inserts, some placed at right angles to the draw, is done in a pair of single-cavity, semi-positive molds used alternately in a duplex press, which has been fitted with a heat-insulating cover and sliding door on the hot end, in an effort to conserve steam. The cycle involves 7 min. for heating and 2 min. for cooling. The operator, because of this rather long cycle and the large number of inserts, can produce only 3 pieces an hour, per mold, including fin removal.

Wattmeter staff of aluminum rod, the two sections of which are joined by a section of Bakelite molded around their knurled ends. The Bakelite piece is only 0.07 in. in diameter and 0.18 in. long. Drawing is five times actual size



Besides the fairly large pieces described and many others of similar proportions, scores of small pieces down to thin-wall bushings not over ⅛ in. in diameter are produced by molding. One of the most unusual pieces made is used to join the two parts of a wattmeter staff made from aluminum rod about 0.05 in. in diameter. The Bakelite holds the two embedded ends in correct relative position, and insulates them against electrical leakage up to a 500-volt potential. The two inserts, totaling about ¾ in. in length, are held centrally in a split conical die, while the Bakelite is molded around their two necked and knurled ends, forming an insulating sleeve about $\frac{3}{16}$ in. long and $\frac{1}{16}$ in. in diameter. This fussy little job requires extreme care in weighing the charge and in handling. Molding is done at the rate of about 4 to 5 pieces an hour. This piece is an example of the length to which the organization that produced the first commercially molded Bakelite parts some twenty years back goes today to insure the desired results.

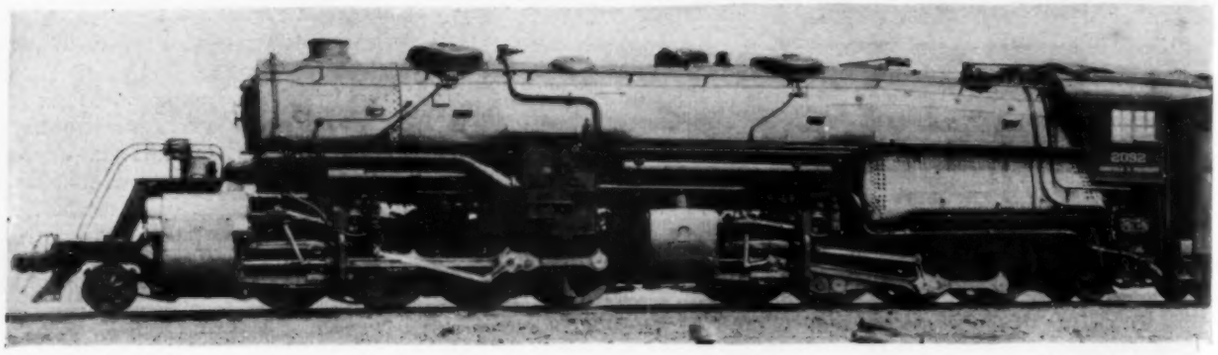
Aluminum Rivets for Aircraft

ALUMINUM rivets may be driven either with a hammer or in a rivet-squeezing machine. A larger hammer is required to drive aluminum rivets than rivets of some of the other commonly used metals because heavy blows are required to head them up. The squeeze method is preferred; this method is employed where feasible and is widely used in aircraft practice. The pressure depends largely upon the size and shape of head formed.

In forming rivet heads by the squeeze method, the pressure builds up very rapidly towards the end of the forming operation; in fact, if the pressure is not released soon enough, the rivet dies close practically solid against the sheets that are being riveted. If this is done, the result is to cause the sheets to buckle or to become wavy. The avoidance of this condition depends largely on the skill of the operator. When the ratio of rivet diameter to thickness of sheet is small, the tendency to cause waviness is less. In other words, a small rivet driven into thick sheet will stand more pressure without causing waviness than when driven into thin sheet, because the bearing area is greater.

Each rivet has a specified minimum grip length, and the maximum is dictated by good practice in any particular joint. As stated above, there is a tendency for the sheet to become wavy when the diameter of the rivet is unusually large with respect to the thickness of the sheets that are riveted, a condition that is generally recognized in rivet practice, regardless of the material that is being riveted. Another reason for specifying a minimum ratio of rivet diameter to thickness of sheet is that if too large a ratio is used, the resulting riveted joint will be weak in bearing and therefore likely to fail by crushing of the sheet.

It is very important never to use annealed duralumin rivets, especially in aircraft work. Duralumin rivets only in the heat-treated condition should be used, as this material in the annealed condition has very poor resistance to corrosion, and besides its strength is only about half as much as when in the heat-treated condition.



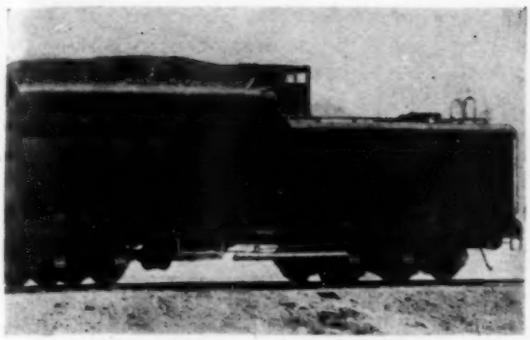
Railroad Repairs at Roanoke

AN EXCELLENT example of the progress that has been made in modernizing the handling of railway repairs can be found in the Roanoke shops of the Norfolk and Western Railway. Not only are the buildings of modern construction and the machine equipment much better than is usually the case but methods and personnel have received careful attention and efficient operation is evident. This shop is the manufacturing headquarters for the entire system and also acts as a clearing house for old tools, grinding wheels and the like, from the different shops. All of these tools and grinding wheels from the various shops along the line are sent to Roanoke instead of being scrapped or salvaged where used. In many cases, as with grinding wheels, the large shop can find uses for them on higher-speed machines than are in the small shops. Where tools can be salvaged economically they are put back into service, and in any case a check is kept on the tools in the different shops. Grinding wheels and many other items have been carefully standardized.

Parts requiring frequent or occasional renewal, such as valve motion pins and bushings, spring and brake rigging pins and bushings, etc., are manufactured at Roanoke for the entire system. All bushings are case hardened and accurately ground internally to exact size. These bushings are carried in stock in two sizes; nominal size and oversize. The outside of the bushings is not ground in the majority of cases, but left smooth turned and hardened. Where extreme accuracy is required, such as in valve motion work, bushings are ground internally and externally. The pins used with the above-mentioned bushings are case hardened and ground to standard size, generally speaking. The brake and spring rigging pins, however, are not ground after hardening, as $\frac{1}{32}$-in. tolerance is allowed and grinding is not necessary.

Old piston rods, side rods and other parts are used to make other parts but not until they have been properly heat-treated at the Roanoke plant. Other shops on the road are not permitted to attempt reclamation as they do not have the proper facilities for determining the quality of the steel nor for treating it.

Down the main bay of the machine shop. Modern as to construction, lighting and equipment



One of the 476-ton Mallets built at Roanoke. It carries 22,000 gal. of water and 26 tons of fuel

Other interesting innovations are the use of a thread miller for mud plugs and for the large nuts used on crankpins, wrist pins, knuckle pins and the like; automatics for small special nuts, cap screws, valve motion pins and bushings, and similar parts; and a well equipped gear-cutting plant that handles gear work for the whole system. Tools are ground in a central toolcrib, and steel used in tools is conserved by forging down to smaller sizes on a nazel hammer when possible. All tools are sand blasted to aid in discovering cracks.

Great care is taken in selecting new equipment, both demand and productivity being carefully considered. In a few cases new heads from builders of modern radial drilling machines have been put on old machines to advantage. In one case two such drilling heads put on an old rail drill converted it into an excellent machine for drilling and boring connecting rod ends.

Milling is used in many places where the planer and slotter formerly held sway. But shoes and wedges are still planed in spite of experiments in milling them.

Grinding is used to a greater extent than in most shops and is proving very satisfactory. Its use will be extended as machines can be secured for other work.

Shop executives are particularly interested in finding a method of grinding the taper holes for crosshead pins in the two sides of the crosshead. So far no satisfactory method has been presented. The pin is already ground all over. Piston valve rings are ground but the valve bushings are reamed. Connecting rods are ground for floating bushings as are crankpins, axle bearings, piston rods and other fits.

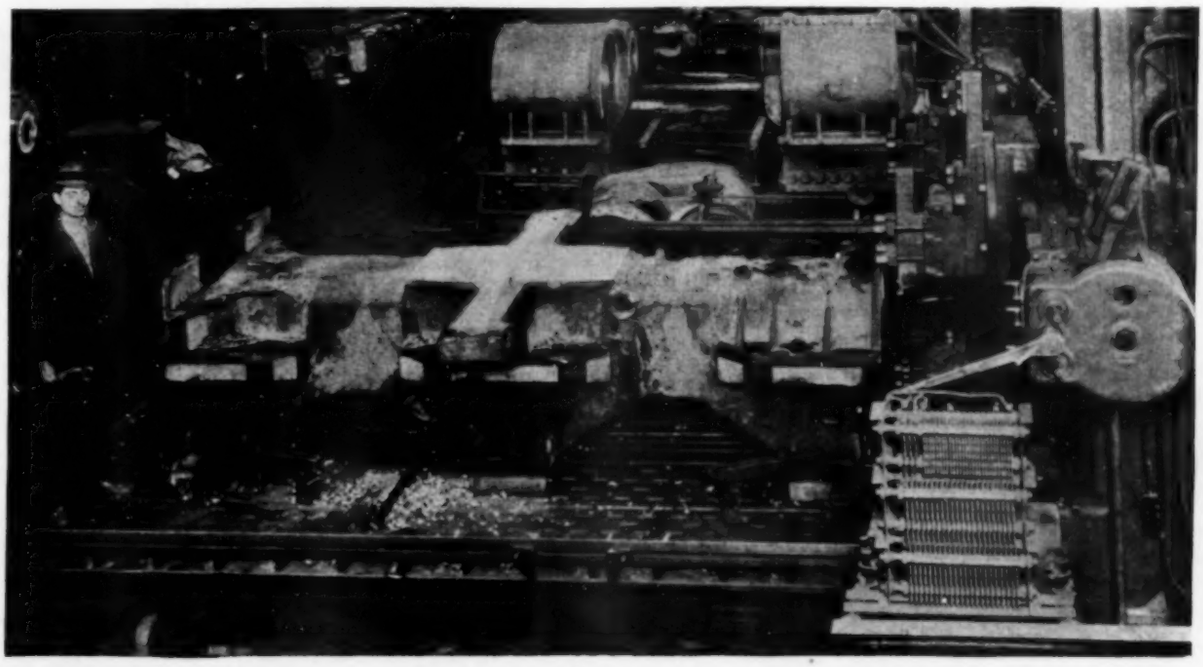
Taper bolts are turned in a four-spindle bolt-turning machine which is arranged to give the proper taper of $\frac{1}{16}$ in. per foot. Gages show the length and diameter under the head, and preparations are being made to finish on a centerless grinder. When completed the bolts are kept in wooden blocks to prevent their being nicked or injured in any way.

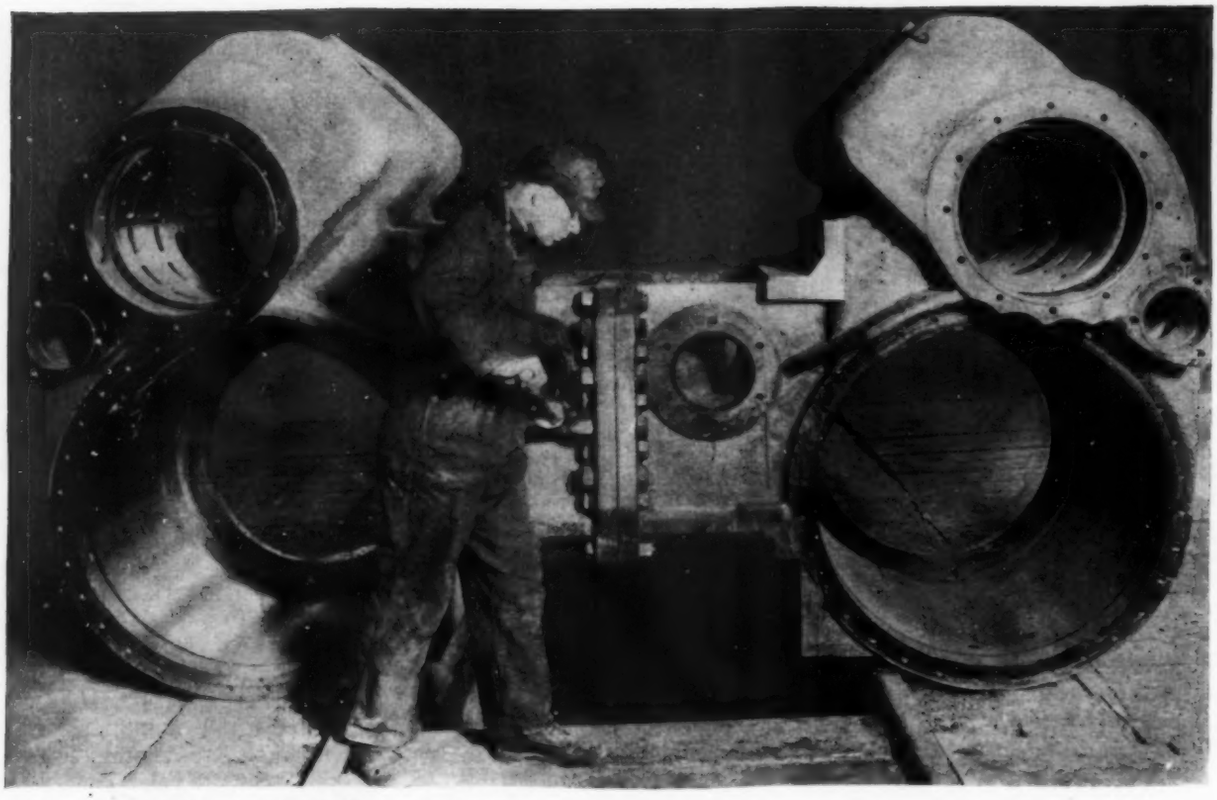
Every machine which is run by a regular operator has a neat metal plate bearing his name in a conspicuous place, as will be seen in some of the illustrations. This practice has several good points. It gives the man a feeling of recognition as an individual and a pride of proprietorship in the machine. Then, too, the higher executives, on trips through the shop, can call each man by name and add still more to his self-respect. Undue machine maintenance cost can be taken up directly with the operator who feels much more responsibility than when he is simply a number on the pay roll.

Careful attention is paid to maintaining correct measurements. Each shop on the line has master trams for important measurements such as valve motion centers, side and main rods, and the like. Every six months these master trams are sent to Roanoke to be checked against the reference trams that are kept solely for this purpose. Working trams are checked against the shop master trams at frequent intervals. Other gages are also checked as frequently as experience dictates. The toolroom also possesses a graduating machine with which brass scales are being made and attached to various machine tools to make it easier to set work and tool slides to their proper position.

Breakages of all kinds are carefully studied with a

One of the machining bays where heavy planing is done





Just an idea of the size of cylinders now in use

view to finding the reason, and frame breakages on Mallets have been reduced to a minimum in this way. Drag ring breakage in pistons has also been reduced by refacing the ring grooves in the piston heads. It was found that the heads distorted about $\frac{1}{32}$ in. in service and that new drag rings were broken with annoying frequency. This has been eliminated by refacing the ring grooves at each shopping.

All cylinders are bushed. Brass liners are used on the driving boxes where they bear against the shoes and wedges. Two ring oil grooves are cut on each face, the upper ring being cut deeper than the lower which intersects it so that oil from above works its way down easily. Greater care is being taken with lubrication than ever before, some locomotives being equipped with pumps that keep oil flowing as needed to the different bearings.

Thoroughness is apparent on every hand. Pneumatic tools are tested after overhauling both for work and air consumption and must pass definite standards. Chain hoists are tested by lifting actual loads. The hoists are hung in a steel A-frame and made to pick up one to six weights of 500 lb. each. Any desired load within the 3,000-lb. limit can be applied by inserting a bar at the proper place.

Lastly, so far as this article is concerned, the shop is not only maintaining the road equipment but is building 20 big Mallet locomotives that weigh 953,000 lb. and have 121,000-lb. tractive effort. While built primarily to help maintain its full working force, costs are carefully kept. Even including overhead of all kinds, the total cost is said to be very satisfactory to the management. Details of some of the interesting jobs and methods will appear in other articles.

The first of three separate articles describing a variety of interesting and unusual features of equipment or practice at the Norfolk and Western Railway shops.

Three-Wire Measurement of Screw-Threads—*Discussion*

WILLIAM S. ROWELL

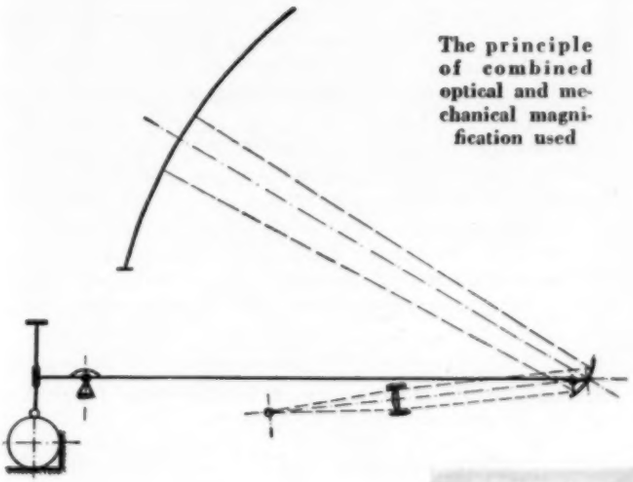
The constants and derived wire sizes contributed by James R. Cornelius (*AM*—Vol. 74, p. 805), may be used in producing screws of minus O.D. It is true that most screws are so made; but also true that such screws rarely call for limits close enough to warrant the use of wire measurements, while taps, which should be held to close limits, are almost invariably made with plus O.D. The Tap and Die Institute gives: Sizes from $\frac{1}{4}$ in., 20 to $2\frac{1}{8}$ in., $4\frac{1}{2}$; minimum, 0.001 to 0.002 in.; maximum, 0.0035 to 0.008 in. It will thus be seen that in tap chasing, the class of screw cutting where wire measurements are most often used, the wire sizes given are almost useless, because of interference between measuring surfaces of the micrometer and the O.D. of the tap. This interference would not occur in pitches coarser than 4; nor in all finer pitches, if micrometer makers would make a special micrometer.

It is well to be able to compute M (measurement over wires) for any size of wire one wishes to use. Formulas for different forms of threads are now given in mechanical handbooks, and in many cases M is given in tables, saving time and chance of error.

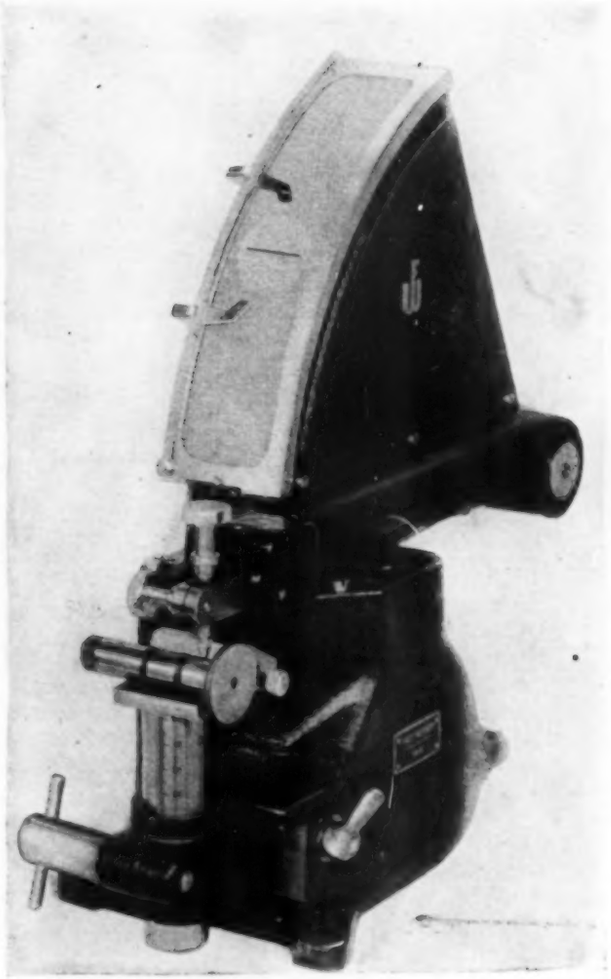
M:. Cornelius shows a V thread with $\frac{p}{25}$ truncation, both crest and root, but fails to show D, basic $O.D.$ If the truncated crest touches basic $O.D.$; pitch diameter, E, is greater than basic, in other words the screw is oversize. Formulae for computing M for different threads, diameters and wire sizes are included in the *American Machinist's* Hand-book. Consult it, and be sure.

A Mirror Comparator

for Production Inspection



The principle of combined optical and mechanical magnification used



Standard unit for inspecting shouldered work

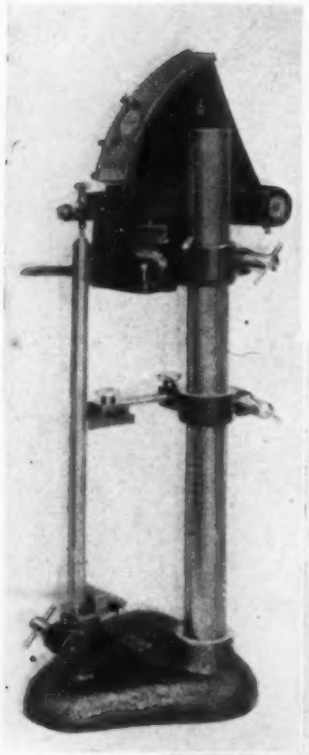
OLIVER P. VAN STEEWEN
Berlin, Wilmersdorf, Germany

THERE is a definite trend toward increased accuracy in the manufacture of small parts and machine elements, necessitating the increased application of optical means of inspection. A new precision inspection device of this type is the mirror comparator, produced recently by Warner & Cie. A.G. of Berlin. The unit works with combined optical and mechanical magnification, the piece to be checked being placed on an anvil and against a locating face, while a contact screw is brought to bear upon it. This contact screw bears on the piece with the correct pressure, working independently of the "feel" of the operator. The result of the test is shown on a frosted glass by a dark line against a circular background of light. The comparator is set by means of master limit gages, plus and minus limits being indicated on frosted glass by adjustable pointers.

Comparator arranged with parallel adjustable contact pin with quick-lift for gaging thickness of sheet

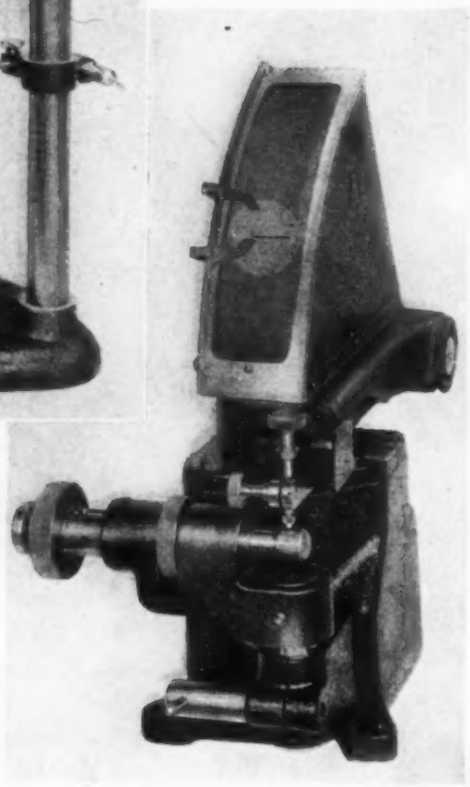
A combination of optical and mechanical transference gives a magnification of 1000-1, so that an error of 0.001 in. on the piece under test would cause the indicating line to be displaced an inch on the glass. Light is provided by a small electric lamp working from the regular lighting circuit through a small transformer or resistance. Since the dark line appears within a circle of light, the apparatus is independent of other plant lighting arrangements.

A variety of special anvils and bases are available, depending upon the work to be done. The instrument is usually used with either vertical adjustment or vertical and lengthwise adjustment of the anvil for checking parts with several diameters. With either type of adjustment, outside diameters as large as 2 in. can



Arranged for checking length of long parts

Arranged for thickness of wall determination on hollow work, by using an arbor



be checked. The top portion of the comparator can be removed from the standard base and fitted to a special base. The tolerance range is especially notable, the glass indicating screen being of a size permitting indication of errors as small as 0.006 in., thus suitable for all normal tolerance systems. With suitable bases the unit can be used for parts up to 20 in. in length.

Next Week

Cold - treatment, heat - treatment, "stainless" steel fabrication, welding, short pithy abstracts of the most timely papers to be presented at the National Metal Congress—all will be included in the issue of September 17.

Guessing Speeds from Other Fellows' Charts—*Discussion*

CHARLES R. WHITEHOUSE
Standards Engineer, Holtzer-Cabot Electric Co.

JOHN R. GODFREY deserves praise for criticising (*AM*—Vol. 74, page 569) what I have always considered the big obstacle to true efficiency. The method of determining feeds and speeds from prepared charts may be O.K. with new machines, new tools and materials of a standard grade. But machines and tools wear, and who can absolutely control the grade of material? These charts work a hardship on the operators since the rates are set for the best possible results.

The main trouble with this method is that it gives one a false sense of efficiency. If a time study man who is setting the rate on any particular job or machine knows his business, he can set the rate to get the best average performance from the machine as well as the operator. He gets a true record and one that the production man can use, when figuring his production, without getting into trouble. The employer is in no danger of loss from using this method. All systems specify that, in the event of change of methods or tools, a new study must be made.

The method of using outside charts, except perhaps as a check, is a confession of weakness. Either the management does not have confidence in its time study men or the men lack experience and fall back on charts. If the employer could know the difference between true and estimated efficiency in his plant, he would put capable men on the job and not rely on charts from other plants.

Standardizing Overhead Conveyor Practice

ALEX PRIOBLE
President, Saginaw Stamping & Tool Company

AN EXTENSIVE survey of present trends in overhead conveyor practice reveals several points upon which the majority of conveyor users seem to concur. The first is that the I-beam track best answers requirements for the majority of material handling needs. The second is that the 4-in. I-beam track is, in the long run, the most economical for the greatest number of cases. Reducing the size of the track below 4 in. increases the number of hangers and bracing necessary to obtain the proper rigidity; increasing the size of the I-beam above 4 in. rapidly increases its weight and cost.

The standard two-wheel trolley and what is generally known as the No. 458 chain are also found to satisfy the majority of conveyor installations. The No. 458 chain will operate on curves with a minimum radius of 6½ ft., which is short enough to satisfy 80 per cent of existing layouts. When made of properly selected materials, tensile strengths up to 30,000 lb. per sq.in. are readily attainable.

Likewise, the open-type ball-bearing steel-flanged wheel fastened to bracket and allowing 8 in. between the center line of the chain and the top flange of the I-beam is by far the most popular trolley assembly. Obviously, more than one type of chain attachment is necessary, but the range of attachments can and is being limited to comparatively few. This combination of trolley and chain has survived and become increasingly popular, representing a natural standardization.

What of the Foundry?

Discussion

PAUL R. RAMP

Courtesy of Link-Belt

SOME months ago I had the pleasure of reading Chester B. Lord's article under the above title. He covered the ground thoroughly, from a machine shop point of view. Knowing Mr. Lord as I do and knowing also how well he is acquainted with foundry operations, I can hardly understand why he did not write "What can we do without the foundry," rather than "What of the Foundry."

Among other things questioned was why, when making a number of large segment castings to be fitted together, from the same pattern, they could not be made so the joints would match without an excessive amount of stock for machining. In his opinion, if the shrinkage of the metal was properly figured when the pattern was constructed, there should be no necessity of adding so much machining stock in order to overcome the variations in the casting.

It is sometimes difficult to produce a large segment casting true to the drawing, especially the first one produced. True, it is possible to figure what the shrinkage per inch will be in these castings and, to some degree, which way they will pull or warp. It is generally conceded that a segment casting, when shrinking, will straighten out, or the radius be increased, but this is not always true because the number of flanges, bosses and ribs have a great deal to do with how the casting will warp or how much it will be drawn out of shape by the shrinkage. The proper way to produce these castings so there will not be excessive stock for machining would be to make the first one from a pattern that will check with the drawing. After the casting is made have it carefully measured and checked and the pattern altered sufficiently to take care of the deformities that occur. In doing this, it may be necessary to make the pattern considerably different from what is called for by the drawing. This is not unusual practice. Very often, owing to shrinkage troubles, crooked patterns are used in order to produce straight castings. If the first segment has been made and the pattern altered to take care of the deformity, the balance of the segments should match together without the use of the excessive stock complained about, providing the mold for each casting is rammed and clamped in the same manner. One mold rammed softer than the other will result in a thicker section of metal, which means a different kind of a draw on the casting that will upset all calculations. The same thing will happen if the mold is not securely clamped and is allowed to strain when it is poured.

So the only exception I take to his demand that all segments could and should be made to match without excessive stock is that it is not always possible to do this with the first casting made.

He referred to another trouble experienced with castings by the machine shop. That is the question of lugs and flanges being properly located so that they will match and eliminate the additional machine shop cost of welding, plugging, drilling, etc. It is true the foundry can very often improve this condition by carefully checking the pattern and the first casting produced and making sure the flasks the molds are made in do not shift. Loose flask pins produce a great many mis-matched castings; and there is hardly any excuse for loose flask pins in the foundry. When cores are used to form a boss or flange a molder must be instructed to place the cores in their proper place in the core prints. Not only to see that they are properly located in a print but to nail or anchor them, if necessary, so there will be no possibility of these cores moving when the pressure of the metal is exerted against them.

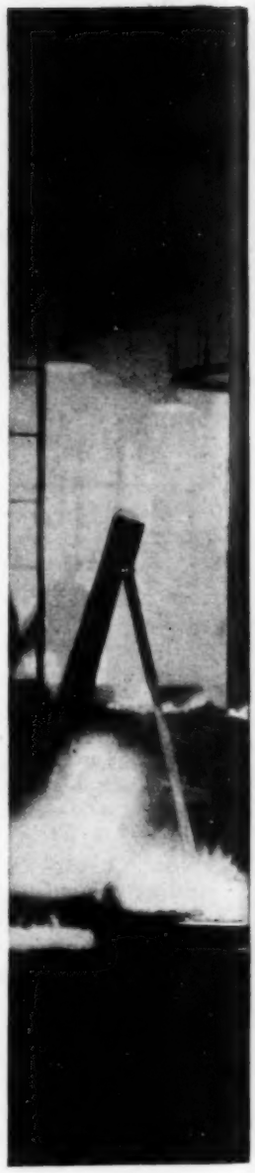
Another reason why these mis-matches in lugs and

flanges occur is the fact that when a pattern has been used for some time, the dowel pins become loose or the pin holes enlarge, which allows the loose section of pattern to shift while the mold is being rammed. The only way to prevent this trouble is to have all patterns with loose pieces carefully checked before they leave the pattern storage for the foundry, regardless of how many times they are taken in and out of the pattern storage. There are many cases where the foundry can really save a great many dollars for the machine shop by using more care in checking their patterns and their foundry equipment.

It was also suggested that the foundry, unlike the machine shop, had perfect control over all raw material and there was nothing to prevent them from producing just what was wanted, while the machine shop was obliged to take whatever was sent to it. This is the part of the article that I really take exception to. The machine shop receives a casting, checks it, inspects it, accepts it or rejects it. If the shop accepts, all it is obliged to do is to machine the casting according to the drawing. This is, to my mind, a simple operation for those who are competent to do machine work, because they have the whole picture before them; a casting of certain dimensions, shape and size to be plained, bored, drilled, etc. The only thing that really interests them is that there is sufficient stock for machine work and the metal is clean and soft enough to work.

Consider all that is involved in producing this casting in the foundry and compare it to how little is involved in machining it in the machine shop, and it can readily be seen that the foundry work is by far greater than the work of the machine shop. To make this casting the foundry has numerous things to consider. First, the sand to be used to make the mold is as important as the metal that is poured into it. If it is a light casting a certain grade of sand must be used and a special facing mixture must be provided. If it is a heavy casting, an entirely different grade of sand must be used and a different mixture of facing. It must be determined whether the cores are to be made in green sand, dry sand or oil sand; and the sand mixtures in each case must be carefully considered to produce the proper results. The same applies to the mold. The green sand mold for a heavy casting requires considerable care in the way of facing, venting, ramming and finishing. If it is a dry sand mold, again we have the question of the sand, the drying and the venting. If it requires a loam mold, we then have an entirely different sand and molding proposition. So it can readily be seen that each individual casting made in the foundry calls for a special treatment and special material and, unfortunately, the sand which is one of the raw materials, is liable to vary without notice with disastrous results if the plant lacks a laboratory for checking its material, which most of them do.

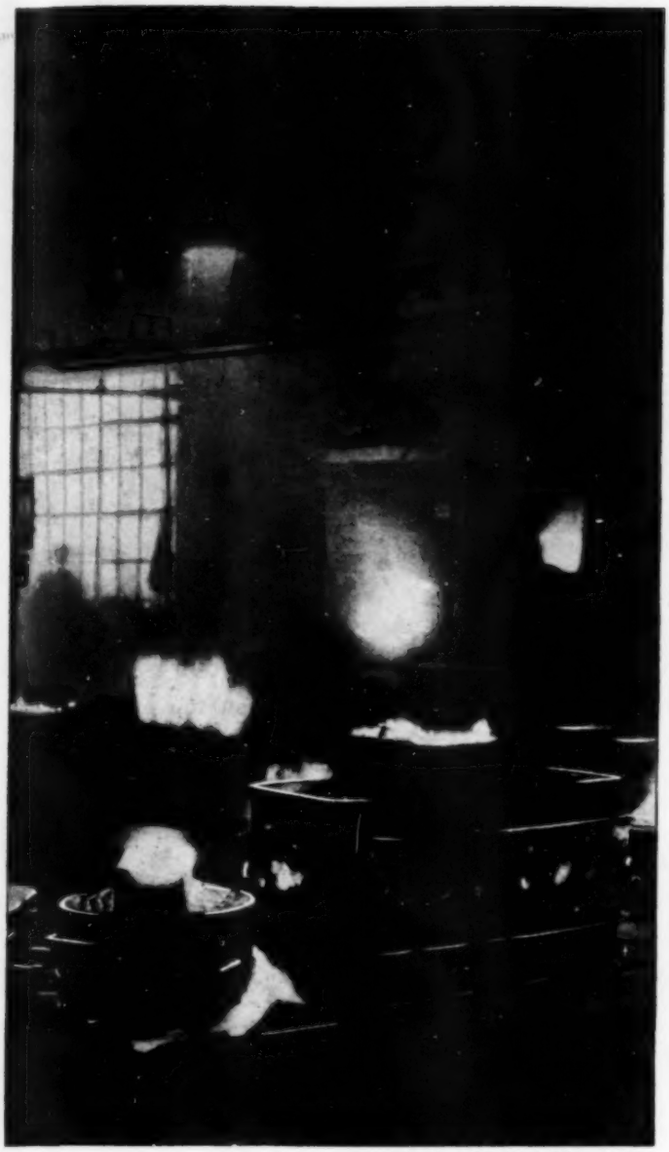
Next in importance comes the metal for the casting. The specifications may call for high tensile or special analysis; in order to secure this the pig-iron scrap in the yard must be carefully analyzed and a mixture secured that will produce what is required. And in this connection allowances must be made for oxidation and variation of analysis. When this is taken care of the next problem is the proper operation of the cupola or whatever melting equipment is used. It is a well-known fact that the same mixture of metal "melted cold" will produce an entirely different grade of iron in the casting than if it is "melted hot." Consequently the foundry must give as much attention to the melting of the charge as it does to the making of mixtures.



The molding equipment such as flasks, sweeps, loam plates, rings, arbors, etc., must all be considered by the foundry in producing this casting. When the mold is ready, the metal is in the ladle. The plan of pouring the mold and feeding the mold is the cause of much study and thought. A perfectly well made mold can produce a defective casting if the pouring and feeding are not done correctly. Just imagine the pouring of a mold for a large casting. The metal is in the ladles, each ladle has been properly skimmed so that there are no impurities floating on the surface. The ladles are moved by the cranes to the various pouring basins and at the signal given by the one in charge, the pouring is commenced, and at no time from the beginning of the pouring operation until the mold is filled must the pouring basins be allowed to drop below a certain level. If such a thing does happen the result will be a casting containing slag and other impurities. If sufficient metal has not been collected to pour the mold, it generally results in a defective casting. If the vents are not all lighted at the proper time there is danger of an explosion or a blow. If the pouring does not cease when the mold is full, there is another danger of straining the mold, causing a run-out or an enlarged casting. If the metal is not sufficiently hot there is danger of it not flowing through every part of the mold, and the result is a mis-run casting. If the mold is not properly clamped and the pressure of the metal causes some part of it to give way, the result is another piece for the scrap heap. So it can be seen that the pouring of a mold to produce one single casting is in itself a job equal to all the work done on the casting in the machine shop.

After the casting is poured, judgment must be used as to how long it must remain in the sand to prevent cracks or excessive hardness. When the casting is taken to the cleaning department, more work and thought must be exercised in getting it ready for the machine shop without excessive cost or without it being broken by the cleaners, or bosses and flanges chipped off by mistake.

So I cannot help believing that the making of a casting is a greater problem than the machining of one. The raw material for a foundry is never under its control. The car of pig iron may be received and analyzed and the analyses may show the silicon, sulphur, phosphorus and manganese just what they should be, but it must be remembered that the analyses does not represent every piece of pig iron in a carload but only 4 or 5 pieces picked at random. The scrap iron used is always of an unknown quality except the return scrap from the



Courtesy of C. O. Bartlett & Snow Co.

cupola. As stated before, the sand varies each week and the same thing applies to all foundry material.

The foundry has no jigs or fixtures they can use to ram, vent, finish molds, mix facings, tuck bars, set gaggers, etc., consequently, the making of each mold must receive the same careful treatment, except in a production foundry where molding machines are used.

"What of the Foundry?" Mr. Lord's title, I believe, was selected because he fully realized that there were numerous questions that could be asked under that title; and when I hear the machine shop complaining about the lack of intelligence in the foundry I am tempted to ask, What of the foundry that must make their condensers shells, marine cylinders, turbine casings, centrifugal pumps, hydraulic runners and other castings in loam molds with no patterns to guide them except a sweep, a distance stick or a skelton frame? I do not believe anyone feels that the men molding this kind of work in this manner are not highly intelligent mechanics and are really entitled to a few mistakes, although they may cause some trouble to the machine shop.

What of the foundry that must produce in dry sand and sectional cores, castings for hydraulic presses, locomotive cylinders, Diesel engine and air compressor cylinders, pump plungers and other similar castings?

What of the foundry that must produce a thousand or more automobile cylinder blocks per day with a loss of not over 20 per cent in defective castings, and not over 6 per cent welded or repaired castings? Every minute detail is taken care of in providing the molding equipment and the core making equipment for this kind of work. The metal thicknesses are held within $\frac{1}{32}$ of an inch; and the stock for machining does not vary over $\frac{1}{64}$.

What of the foundry, the steel foundry that must give careful consideration to shrinkage problems, sand control, core making, feeding, gating methods, surface and internal chills, followed up by the necessity of keeping closely within a specified analysis and producing a metal that will be within all physical requirements, such as bend test, elongation, tensile, reduction of area, etc.?

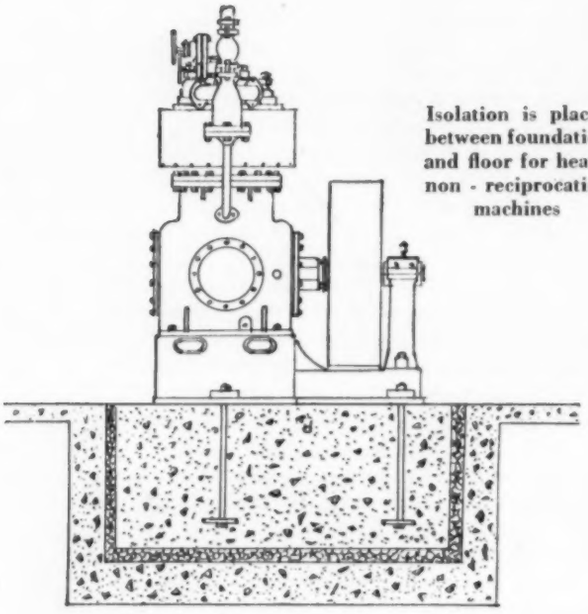
What of the non-ferrous foundry which must produce manganese bronze that will pull not less than 65,000 or 75,000 lb. per sq.in., the high pressure valve with walls $\frac{1}{4}$ in. thick that must stand 600 to 700 lb. pressure without leaking? Then there are seats for valves, air compressors and pumps, hydraulic runners, pump castings and many other castings that must be absolutely free from defective metal, sand holes, blow holes, etc.?

We could go on indefinitely asking what of the foundry from many different points of view, but the only thing we are interested in is to have it understood by our friends in the machine shop that the foundry is not a necessary evil, that it is in reality at the head of the procession as far as progress in their line is concerned More of the machine shop work is being done in the foundry every day. Numerous castings that in the past have been made in several pieces are today cast in one piece successfully. This work taxes the ingenuity of the foundryman a great deal more, we believe, than it does the skill of the machine shop man to machine the three-part casting made in one. It is true there was a time when castings from the foundry were more or less of a chunk of iron resembling somewhat the shape that was required, and the machine shop did the rest. But it was discovered that this was not necessary, that castings could be made the required shape and with much less machine work necessary; and as this work developed the foundryman developed with it; so that today it is not so much a question of whether or not a certain piece can be molded and cast a certain way as it is the question of whether or not it can be machined if made a certain way.

We can hardly blame the machine shop for sometimes feeling as though the foundry were not a scientific institution, especially after he has called the foundry supervisor over to his shop to show him some castings that develop defects after machining. The foundryman will look at one defective casting and probably say it was rammed too hard. He will pick up another one, as far as the machine shop can see the defect is identical, and call it a core blow; the next one which contains numerous sand holes will be christened scab; another one just like it, a burn-down, and so on through the entire pile of defective pieces. The machine man cannot understand why all these different causes are blamed for what apparently is the same defect. As a result he concludes that the foundryman is simply bluffing. But it is true there are so many different things in the foundry which can cause the same trouble that it requires eternal vigilance on the part of molders and supervisors to produce perfect castings day after day.

Noise Elimination in the Shop

Cork foundations or pads absorb vibration and thus diminish or entirely eliminate noises



Isolation is placed between foundation and floor for heavy non - reciprocating machines

E. S. PENN
Armstrong Cork & Insulation Company

TODAY we hear much about noise abatement. Committees have been formed in practically all large cities to cope with the problem. In many sections, the situation has reached such proportions that inhabitants are literally bathed in a pool of nerve-racking noise. Fortunately, it is possible to eliminate much present day noise, especially that from vibrating machinery.

Noisy power houses and manufacturing plants have been successfully quieted. Buildings, undesirable because of vibrating machinery, have been made pleasantly habitable. Precision instruments are now used in the same structures with heavy machinery and are unaffected by it.

A large part of this progress has been achieved because of the physical properties of cork, one of the most widely known materials for absorption of vibration and reduction of noise. Since thousands of minute air cells make up its structure, cork forms a quieting cushion of entrapped air which serves efficiently for a long time.

Due to its natural characteristics, the only dimension that changes when cork is compressed is the one in line with the force supplied. It does not spread or take a permanent set. After pressure is relieved, cork comes back to practically its original dimensions.

Among the general classifications of machines successfully isolated are machine shop equipment, motors and engines, fans, blowers, pumps, printing presses, mixers, elevator machinery, centrifugals, and drop hammers.

Numerous factors are involved in selecting the type of isolation to be recommended. The size and type of the foundation as well as the quantity, density and thickness of isolation material depend upon whether the machine is light or heavy, rotative, has either horizontal or vertical reciprocations or a combination of both.

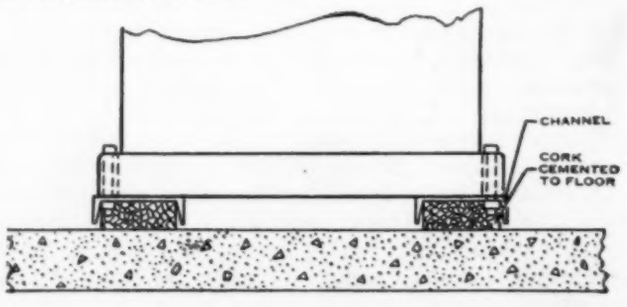
Generally speaking, light weight rotating motors, fans, and other similar equipment require relatively simple foundations. Involved mathematical calculations for them are not justified. However, large pulsating machines, such as mixers, drop hammers and centrifugals, should be considered as a part of or integral with the foundation and isolation material. For these, large massive concrete bases are provided on top of which the machine is mounted. Under the entire bottom and sides of the foundation should be placed a two-inch thickness or more of cork.

There are two general methods used in installing isolation. The first is to place the isolation between the machine bed-plate and the foundation. The second method is to place the isolation between the foundation and the supporting surface.

Excessive strains in a machine may result from bolting it firmly to a rigid foundation. The use of isolation eliminates these strains to some extent because the kinetic energy of the moving machine is partly expended in compressing the cork foundation. Purely rotative machines and those which have reciprocating and rotative parts are stressed and strained by the unbalanced forces. When the bed-plates of the machines are firmly fastened to rigid foundations, the stresses are harmful. Cork provides the necessary cushion for the absorption or equalization of the stresses.

Natural frequencies of vibration of an elastic member or system which supports a machine should be much greater or much smaller than the frequencies of the vibrations which are originated in the machine. Otherwise, a harmonic vibration will be set up and become excessive. The intensity of vibration may be lowered by increasing the weight of the machine, attaching the machine to a foundation, or installing isolation.

A simple isolation for revolving or reciprocating machines



With the inside of the joint partly filled with water, the nickel steel expansion element is arc welded to forged flanges

THOMAS O. FORD

Flexible Welds in Metal Bellows

Welds formed by the atomic hydrogen process are homogeneous with the original plate in structure and react similarly to heat treatment

MOST welds are made to stay put. They are employed to form rigid joints between two or more metallic parts. But here is an example where welding is employed to join a series of flexible members and where the weld itself must withstand flexure.

The Flexo Disc expansion joint, manufactured by the Croll-Reynolds Engineering Company, embodies this design. This unit absorbs motion in steam and hydraulic pipe lines up to 30 in. in size under rated pressures up to 250 lb. Joints with laminated expansion elements for pressure up to 450 lb., are now under development. The maximum expansion movement varies from 1 to 5¼ in. The welding problem arises in the fabrication of the alloy steel bellows which replace the older and more familiar copper element.

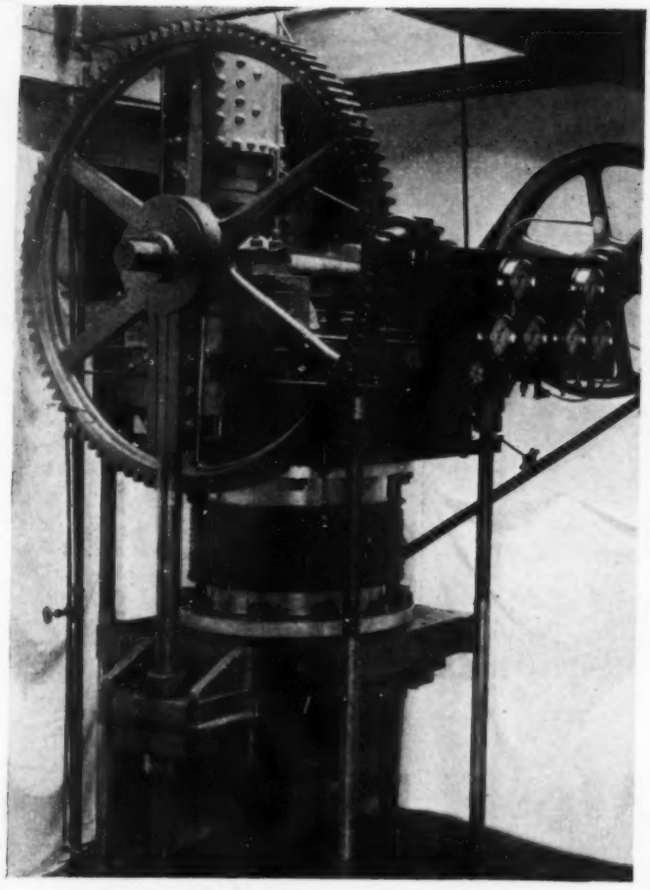
Since the streses in this member are caused by a combination of pressure and flexure, high strength must be attained without loss of flexibility. Any attempt to gain strength by excessively thick walls defeats its own purpose by setting up stresses, which vary with the cube of the thickness, caused by the movement of the disks.

Accordingly, the bellows are made of 3½ per cent nickel-steel disks, S.A.E. specification 2335. These are blanked from sheets to the outside diameter and hole size needed for a particular joint and are then dished to a wavy section to give flexibility. Two flat surfaces about ⅛ in. in width are left on the inner and outer peripheries to facilitate welding. The end plates are flat and of heavier section.

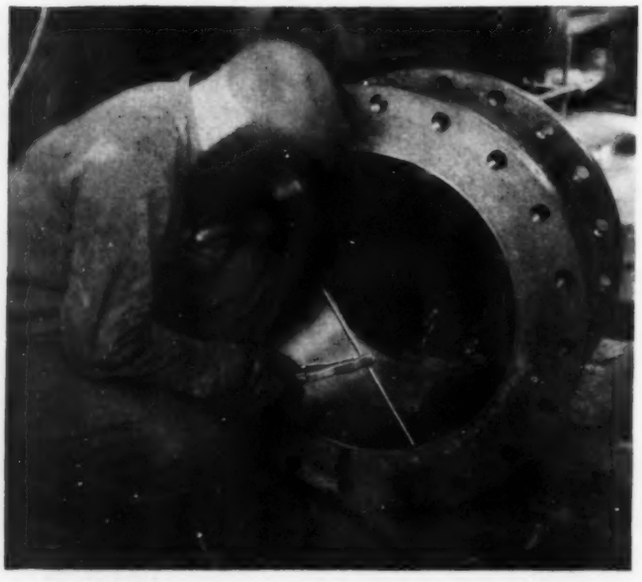
The first step in assembling the bellows is to weld the steel disks in pairs at their inner peripheries. The number of pairs required are then mounted on a jig side by side where they may be rotated by power at a slow speed. In this position, the external welds are completed. The limitations as to thickness, stated regarding the plates, apply to the welds which are also subjected to flexure. Therefore, it is important that the welds have the same strength as the plates and are homogeneous with them. The requirement of uniform structure is essential because of the subsequent heat treatment used to develop the maximum strength in the alloy steel disks.

To meet these exacting conditions, the General Electric Company's process of atomic hydrogen welding is used. By this method, the edges of the plates are melted and fused without the addition of welding rod. Because of the reducing atmosphere, the formation of injurious oxides is prevented. Plates $\frac{1}{16}$ in. in thickness may be welded at a speed of approximately one foot a minute.

Some idea of the extent of the weld needed for one of these joints may be gained from the 30-in. size for a 2-in. movement. The bellows alone for this joint require 230 linear feet of weld. All inside and outside seams are gone over twice. Even for those familiar with the advancement in welding practice, it is difficult to believe that this length of weld could be completed with-



The accordion-like bellows are given 500 reciprocations in a special press before the 230 ft. of atomic hydrogen weld pass inspection



A Monel Metal liner arc welded to one flange and with a sliding fit in the other, effectively precludes corrosion

out the occurrence of pin holes or flaws but repeated tests have shown that they are rarely present. In fact, only one of the last twenty-eight bellows has shown any leakage, and this was quickly remedied by going over a small section of the weld again.

Heat treatment of the expansion bellows is done by the Stanley P. Rockwell Company. Quenching from 1,550 deg. F. in oil and drawing to from 650 to 750 deg. according to the size of the element, produces a yield point of 170,000 lb. per sq.in. and an ultimate strength of about 200,000 lb. per sq.in. Specimens cut from welded sections, when tested to destruction in a tensile machine, show that the weld and plate have practically the same strength.

After heat treatment, the expansion elements are welded to heavy forged steel flanges by the ordinary arc process. To keep the heat of welding from drawing the temper of the bellows, this process is conducted with the unit filled with water to within a fraction of an inch of the joint. This precaution effectively preserves the high strength developed in heat treatment.

Each expansion element is given a thorough test in a press specially designed for the purpose. First a hydrostatic test at the rated pressure of the joint is applied, and the welds are carefully inspected. The pressure is then released, but the water is retained while the element is subjected to 250 expansions and contractions by means of an eccentric motion. The travel is adjusted to suit the motion of the joint by changing the eccentric cams. Then a hydrostatic load of 50 per cent above the rated capacity is applied and the bellows is given 250 more reciprocations. After a final inspection, the joint is removed. The stresses from these tests are equivalent to several years of actual service. When the bellows has been found free from pin holes under the initial pressure no trouble is experienced in the subsequent loading. This is bcause the stresses developed within the capacity of the joint are far below the elastic limit of the heat-treated nickel steel.

Centrifugally cast Monel Metal liners are then pressed into place having a force fit in one flange and a sliding fit in the other. As an added precaution, the tight end is arc welded to the flange through drilled holes in the periphery of the liner. Monel Metal was selected for this service because of its ability to withstand the high temperatures of superheated steam and its insurance against corrosion that might interfere with the free operation of the joint. The addition of a telescopic sheet-metal cover ovr th bllows, to protct it form dirt or pipe insulation, completes the job.

The Perfect Peacherino
Discussion

HARRY SHAW
Consulting Engineer, Hewood, England

Most readers will probably take the editorial (*AM*—Vol. 74, page 928) with a pinch of salt. I won't, for I know of one firm of special machine tool makers who quote for all machines at so much per ton, practically irrespective of class.

An accurate machine for work on gears was quoted by this firm at the same price per ton as a heavy rough-boring machine. A turret lathe—one—was made, (including drawings, patterns and everything for a special order) at about half the price wanted by a manufacturer making practically the same machine (the specification was really of the machine of the latter manufacturer) in batches of fifty.

Yet the firm still lives, but not on machine tools. Profits from one section pay for losses in another.

Ideas from PRACTICAL MEN

Hobbing Telescope Bearings in Standards of Transits

H. S. GRAY
W. & L. E. Gurley

Several years ago we were confronted with the problem of hobbing the bearings in the standards of our transits. The bearings are for the axes upon which the telescopes revolve, and it is essential that they be an accurate fit. They are of the multi-groove type, resembling threaded holes but with the threads having no lead, as shown in Fig. 1. The grooves form an included angle of 60 deg. and are similar in shape to U.S.S. threads. At the bottoms of the bearings are small relieved portions to collect any dirt or foreign matter.

Formerly, we hobbed the bearings in a horizontal milling machine, the diameter of the hob being practically the same as that of the bearings, leaving just enough stock for the final lapping of the mating parts. The caps were removed from the heads of the standards and the one-half of the blank holes in the standards were hobbed. The caps were then replaced and were brought into contact with the hob by screwing down the holding screws. The standards were held stationary, and the hob was revolved while the caps were slowly drawn down until they were squarely in place on the heads, the hob cutting deeper as they were drawn down. After the grooves were finished, the caps were removed and the standards were taken from the machine.

This method did not prove altogether satisfactory, since the hob did not always cut evenly in the standards and the caps. It also had a tendency to dig in on the entering side of the cut. When this occurred, the bearings would be out of line and would cause trouble in fitting. We finally decided to hob the bearings in a vertical milling machine, using a hob held in the spindle running at about 250 r.p.m. On account of the length of the hob (about 9 in.), it was necessary that the lower end be supported by a center. Since the hob was smaller than the blank holes, the standards were rotated about a point that was off-center in relation to the hob. Adjustment of the off-center distance controlled the size of the

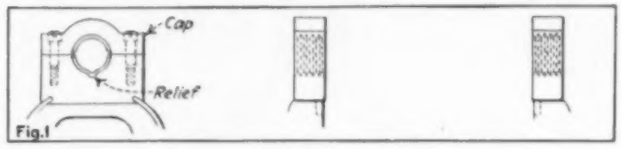
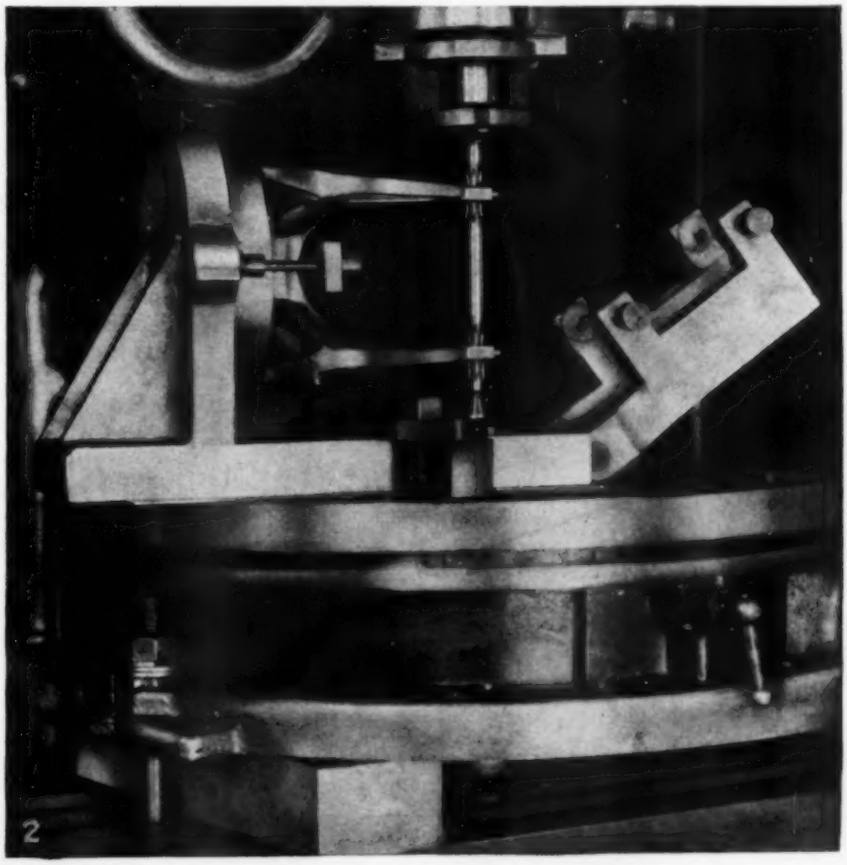


Fig. 1

hobbed holes. The standards were held in a fixture attached to a circular table in such a position as to bring the holes over its center.

The circular table was mounted on the regular table of the machine, so that when the regular table was moved the hob was brought into contact with the holes. Since the holes were off-center from the hob, rotating the circular table caused the hob to cut the grooves. A complete revolution of the circular table was made, after which the bearings were moved closer to the hob for the second cut, and so on until the correct depth had been reached, all of which required about six revolutions of the table. The set-up can be seen in Fig. 2. Finally, without rotating the circular table, the relieved portions were cut in the bottoms of the bearings by moving the standards closer to the hob by means of the regular table screw.

Since the center for supporting the lower end of the hob could not be attached to the circular table on account


2

of the motion of the regular table in feeding the work, it was attached to the vertical ways on the column of the machine by a V-shaped arm, and extended upward through a hole in the center of the circular table. The necessary space for the arm was provided by blocking up the circular table. A regular center was first used, but on account of its heating, a ball-bearing center was substituted. It can be seen that the work can be moved into any position without disturbing the position of either the center or the hob. This simple arrangement solved our problem nicely, and no doubt it might be applied to other special operations that are occasionally met in all shops.

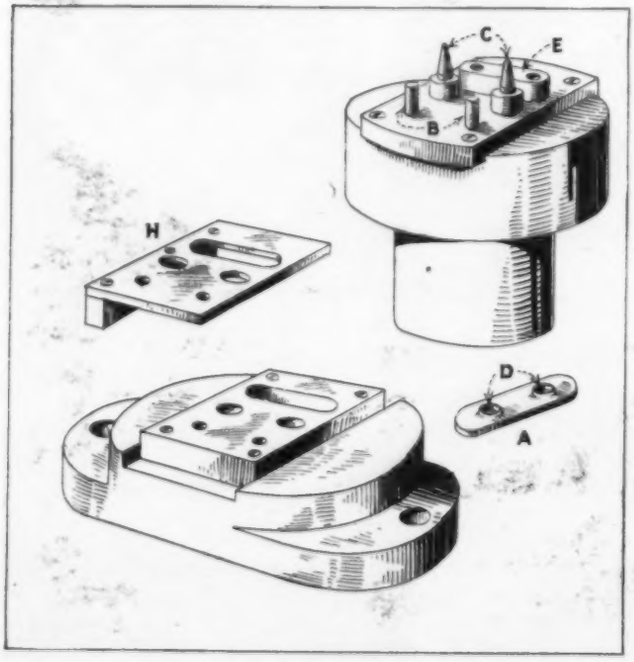
Inexpensive Progressive Tools

CHARLES H. WILLEY
Superintendent of Manufacturing,
Hoyt Electrical Instrument Works

It behooves manufacturers to tool up for production as efficiently and economically as is possible. For the notebook of the tool foreman, upon whom the design of press tools falls, the simple form of progressive tools illustrated may come in handy. While the tools were designed for making fiber parts, such as the one shown at *A*, they would be equally efficient for brass.

The parts are made from $\frac{1}{32}$-in. gray fiber in strips. First, two holes are pierced by the punches *B*. Next, as the stock is advanced, the pilots *C* align the stock by the previously-pierced holes. They also form burrs around the holes, making the collars indicated at *D*. Just before the pilots complete their work, and at the same stroke of the press, the two holes for the second part are pierced. At the next advance of the stock, a part is blanked by the punch *E* and the holes last pierced are aligned and burred by the pilots, and the holes for the third part are pierced. Thereafter a part is completed at each stroke.

The stock is fed by hand and is guided and stripped by the open-end stripper *H*. These tools were very inexpensive to make and are rapid in operation, the labor cost per 100 pieces being but 1½ cents.



Measuring the Pitch Diameter of Taper Threads—*Discussion*

EDITOR'S NOTE: Under the above title (AM—Vol. 74, page 730), Charles Kugler described an adaption of the three-wire method to taper threads. This was later discussed by Andrew L. Schwartz (AM—Vol. 74, page 990). Here are several more suggestions:

F. L. GILLETT

Mr. Kugler's method and formula are satisfactory for American Standard pipe thread gages, or any taper thread gage where the pitch is not coarser than eight threads per inch, or the taper greater than $\frac{3}{4}$ in. per foot. However, his formula has a couple of approximations which produce too great an error in the result when used for gages with a steep taper or coarse pitch.

First, the term $\frac{\cot A}{2N}$ is correct for a straight thread, but for a taper thread, the height H of thread before truncating should be

$$\frac{\cot A - \tan^2 Y \tan A}{2N}$$

Secondly, Mr. Kugler multiplies the measurement over the wires by the secant of angle Y, whereas the distance between the centers of wires should be multiplied by the secant of angle Y. Therefore, the correct formula for taper thread gages using the three-wire method would be as follows:

$$E = (M - G)\sec Y + \frac{\cot A - \tan^2 Y \tan A}{2N} - G\left(\csc A + \frac{S^2}{2}\cos A \cot A\right).$$

Where E = Pitch diameter
M = Measurement over the wires
Y = One-half the included angle of the taper
N = Number of threads per inch
A = One-half the included angle of the thread
G = Diameter of the wires, and
S = Tangent of the helix angle.

On oil well drilling tools, there are a great many sizes of taper threads used, with tapers up to 3½ in. per foot and four threads per inch. On gages for this class of work, we have found the two-wire method more satisfactory. The position of the first wire is determined similarly to Mr. Kugler's method, and the second wire is placed on the opposite side of the gage one-half lead closer to the large end of the gage. For this method, the following formula may be used:

Let y = angle from the axis of the micrometer spindle to the right angle from gage axis.

Then $\csc y = 2N(M - G)$ and

$$E = (M - G)\cos y + \frac{\cot A - \tan^2 Y \tan A - \tan Y}{2N} - G\left(\csc A + \frac{S^2}{2}\cos A \cot A\right),$$

or neglecting the helix angle factor, which in most cases is insignificant, we have:

$$E = (M - G)\cos y + \frac{\cot A - \tan^2 Y \tan A - \tan Y}{2N} - G \csc A.$$

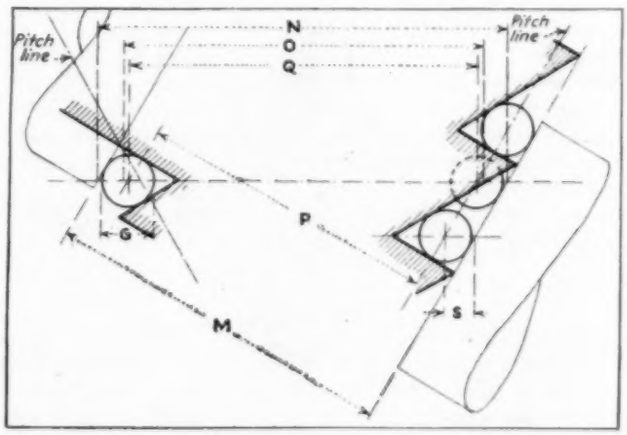
D. Q. DUNSTONE
Hetton-le-Hole, England

I assume that it is desirable to avoid the obliquity of the micrometer with a line perpendicular to the axis of the taper thread gage. Suppose the pitch diameter to be between three and four inches. A dial gage and a bar micrometer are both clamped in the tool rest so they may be adjusted to find contact with work placed in the chuck of the lathe. A 4-in. diameter mandrel is placed in the chuck (or between the centers) and set true by means of the dial gage. The micrometer is then adjusted to touch the surface of the mandrel and the reading noted. That part of the taper to be measured is marked and the thread gage replaces the mandrel. The gage is trued by the dial gage and the micrometer is brought into contact with the wire inserted at the point to be measured. The micrometer reading is taken and the difference from the former reading is calculated. This value is equal to half the difference between the diameter of mandrel and diameter of the gage over the wires.

Suppose the first reading to be 0.898 in. and the second reading to be 0.536 in. Then the diameter over the wires $= 4 - 2(0.898 - 0.536)$
$= 4 - 0.724$
$= 3.276$ in.
From this pitch diameter of the gage may be computed.

WILLIAM S. ROWELL

Measuring taper threads is difficult—so difficult that it is usually avoided. Mr. Schwartz has done readers a favor by calling attention to the method outlined in the 1928 Report of the National Screw Thread Commission. The three-wire method there given seems to present a difficulty in that it is necessary to hold the contact surfaces of the micrometer with exactly the same pressure on each of the two wires on the two-wire side of the gage while maintaining the light pressure permissible. This seemed so difficult to me that I used a two-wire method. I formerly used a simple application of the



two-wire method for parallel work making due allowance for the taper and the modified thread section. However I believe the N.S.T.C. two-wire method to be superior.

In measuring threaded plug gages of $\frac{3}{4}$ in. per ft. taper or less, the helix angle and the modification of thread section may usually be disregarded, especially in standard or finer pitches. While the N.S.T.C. report gives formulas for obtaining these values, to me it seems that when the value of H (depth of V-thread) is enough off normal to be taken into account, that this would necessitate another size of best wire, that is, the wire that contacts the angular sides of the thread above the pitch line. In other words, the thread section on a taper is shallower than section of parallel thread of the same angle and pitch. The thread being shallower, the pitch diameter is greater and a smaller best wire is needed.

Another change that would contribute to the accuracy of results in using the three-wire method of measuring taper threads is to subtract once the diameter of the wire from micrometer measurement over wires, before performing the remainder of the operation. To illustrate:

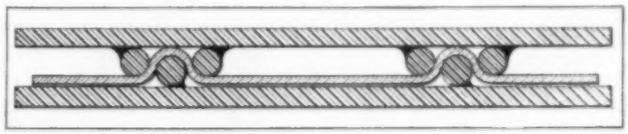
Exaggerating the taper and lead, Fig. 1 shows clearly that G should be subtracted from M before obtaining the value $M \sec Y$. $M \sec Y = N$, $N - G = O$, but $M - G = P$, and P may then be used to complete the operation:

$$P \sec Y + \frac{\cot A}{2N} - 2G = E.$$

Inexpensive Forming Tools

CHARLES KUGLER

For experimental purposes, it was necessary to form a groove in each of some pieces of $\frac{1}{16}$-in. sheet copper. The price allowed for the job was such that to make a regular forming punch and die was out of the question.



The boss suggested that I should spin the grooves in the pieces in the lathe. However, spinning requires some sort of a form and some skill that I do not possess.

I made the tools illustrated in such a way that there was no machine work, and the job was completed in the time allowed. Three rings, as shown in section, were made of $\frac{1}{4}$-in. cold-rolled steel. They were formed to the correct diameters and the ends were welded together. Aftrward they were welded to plates, two rings to the upper plate and one ring to the lower plate, as shown. Placing a copper piece on the ring in the lower plate, the upper plate was put over it and the whole assembly was put in a press. When the ram descended, the plates were forced together and the rings formed the groove.

Self-Indexing Square-Turret Toolpost
Discussion

DONALD RAEBURN
Glasgow, Scotland

The device described by W. N. Delenk in an article under the title given above (*AM*—Vol. 74, page 692) would be an asset to any engine or turret lathe, particularly in small shops.

In many shops, the quantity of tools supplied to the machinists is limited, so that by slight alterations in grinding and setting, the greatest possible use is made of the equipment at their disposal. After an operation has been completed with the first setting of the tool, the

toolpost screw is loosened and the tool is projected toward the work at an angle suitable for the following operation. This procedure is not always satisfactory, since the tool often lacks rigidity of support, thus imparting an element of risk to the satisfactory completion of the work.

With the turret toolpost in use, this risk does not exist. It is compact and strong, and the tools are rigidly supported close to the work. With a toolpost of this type, the operator can set and project his tools to the work with confidence, since loosening the screw to reset the tools is eliminated by the provision of the eight indexing points. Mr. Delenk's suggestion of using a hexagon turret having, I assume, twelve indexing points is a good one.

Radius Link Grinding—*Discussion*

T. GREENING
Coventry, England

Reading the article by J. T. Towlson, under the title given above (*AM*—Vol. 74, page 838), I note that his difficulty lies in obtaining the necessary wheel speed for grinding in the radial drill. The required speed might be obtained by the use of a drill speeder. Such tools now have ball bearings, permitting the attainment of high speeds.

It might be worth while to try the drill speeder, using a wheel of medium hardness. I think the wheel should be fed to the work at each pass, rather than to attempt the plunge cut, which would require a stiffer construction than a drilling machine affords to produce the good finish that I presume is required.

SEEN AND HEARD

JOHN R. GODFREY

Reconditioned Tools

Tool budgets help control tool costs in some shops. Each department is charged for use of all tools. Used tools are put in first-class shape and returned to the tool room. Any foreman using a reconditioned tool escapes the tool charge. This creates a demand for the reconditioned tools rather than the new ones.

It's a good scheme for getting old tools worn out but it doesn't give the real tool cost of a job or a department without calculations that involve the cost of reconditioning the tools.

Progress in Arc-Welding

Those readers with a flair for statistics and those interested in the progress of arc-welding should be stirred by this list of facts on the new million-dollar G.E. transformer tank shop at the Pittsfield Works. It is 550x150 ft., built entirely of glass and steel, even the pilasters being arc-welded. More than 1,500 tons of structural steel, 5,000 linear feet of welds, a ton of aluminum powder for paint, 30,000 panes of glass, and 650,000 wood blocks, or 24 carloads, were required for the building. Insulation one inch thick protects the interior from cold and heat, being laid over the entire 82,500 sq.ft. of welded roof area. Glass used in the south and west sides of the building is of a special actinic type permitting sunlight to enter without glare. Lighting is secured by 138 lamps of 1,000 watts each, supplemented by smaller lights where necessary. Twelve unit heaters are installed. Arc-welding is certainly on the map.

Wide Gears and Old Oil

Lubrication is getting to be more and more important as we use more power in all machinery. And this includes about everything from automobiles to locomotives. Fortunately this is being recognized all along the line. A bus builder tells us that wider faces on gears are not so much for strength in the gear as to make it easier on the lubricant. And now comes an engineer who evidently is not tied up to the oil industry, who says that new oil in an engine is not as good as oil that has been used, providing of course we keep the dirt out of it. This ought to be easy to test and it might help conserve the supply of oil.

Polished Rods Show Cracks

Connecting rods of locomotives were formerly polished to tickle the pride of the engineer. They went well with brass bands on the boiler, polished brass bells and fancy pictures on the tenders. Then we went to the other extreme, and locomotives became sombre, uninteresting, and frequently dirty as well. Now they are polishing rods on some roads but for a very different reason. The polished rods show up minute cracks that might cause failures in service. Chemists, metallurgists and microscopes now play their part in railway operation.

Standards of Length

The speed of light and the length of light waves have been considered constant and it is urged by some that light waves replace length standard metal bars. But now a European scientist, DeBray, tells us that the speed of light waves has decreased fairly steadily since 1902. So, while light waves are very useful in guessing at millionths of an inch, it may be just as well to hang on to our metal standards awhile longer. With proper temperature control they have proved pretty reliable.

Unbalanced Efficiency

As was pointed out not long ago, unbalanced efficiency can put a crimp in the finished product. I recall a case during the war where the man in charge of one part of front-line production kept ahead of his schedule but kept all the other divisions behind. He had a wide acquaintance among machine builders and dealers and got the jump on the others in getting his equipment and material. But he slowed production on the whole unit and delayed the supplies that were needed by the troops. He also got credit when he should have been court martialed. Individual efficiency should be rewarded, but let us be sure it helps the final output as well as the personal record of one man.

SHOP EQUIPMENT NEWS

Hutto Model MV 500 Vertical Internal Grinder

For finish-grinding of heavy work, such as large truck, airplane and marine motor cylinders, Diesel engines, and air compressor cylinders, the Hutto Engineering Co., Inc., 515 Lycaste Ave., Detroit, Mich., has developed a grinding and honing machine known as the Model MV 500. The range of this machine is from bores of from 1½ in. to 8 in. in diameter, and up to 15½ in. in length. With the use of special Hutto grinders, bores up to 18 in. long may be ground. The model MV 500 is of vertical construction and compact in design. It requires a floor space of only 40x54 in. Four reciprocating speeds and two rotating speeds are provided, thereby making it possible to obtain any desired finish in all bores.

A vertical motor supplies power to the machine, and an automaitc starter provides remote control. The head is raised or lowered by a conveniently located crank and can be locked in place at the desired height. The driving spindle is telescoped to permit extraction of the grinder from the bore without disturbing the set-up. A coolant reservoir of 45-gal. capacity is found in the heavy table, and a motor-driven circulating pump and filter provide a copious supply of clean coolant. Smooth and quiet operation are assured by the self-lubricating system. Ball bearings are used throughout the machine with the exception of the spindle on which a phosphor bronze bushing is employed. The stroke adjustment mechanism is easily accessible after lifting off the front plate, which is held in place by four wing nuts.

"Thor" Model 2 Spray Gun

A "Thor" Model 2 spray gun is announced by the Binks Manufacturing Co., 3114-40 Carroll Ave., Chicago, Ill., in which a variable spray is produced by the simple turn of a screw control on the back of the gun, thus maintaining the essential simplicity of the spray gun head. When finishing flat surfaces the operator can spray a large fan-shaped spray, and without stopping to make nozzle adjustments he can cut the width down to a small round spray for a narrow object, such as a chair leg. In the standard models, these spray changes are made by a knurled knob at the back of the head. For large production plants, where uniformity in spraying is desired, a key-type spray control is available by means of which the foreman can set the gun at the desired spray with a removable key. There is also an adjustment for the material control.

A screw control at the back varies the spray width

By means of a stationary tapered seat, the air nozzle is always aligned with the fluid tip, and no regulation is required at this point. Clear straight passages of air ports prevent clogging and permit speedy spraying. No paint or finishing material comes in contact with the material spraying or air control parts. Downpull at the head of the gun from the weight of the material hose is balanced by the air inlet hose at the handle. This balance gives freedom of movement to the trigger finger which has a light straight pull backwards. On the first release of the trigger, the air only passes through the gun, cleaning off and dusting the surface to be painted.

The body of the gun is drop-forged steel, while the handle is a zinc-base die-casting. Both the fluid nozzle and the needle valve are of special stainless steel, while the air nozzle is drop-forged bronze.

The gun can be used with a siphon feed cup, gravity feed container, or a pressure feed container. The same nozzles are supplied for both the siphon cup and gravity feed container, requiring an air pressure ranging from 40 to 60 lb. Three sizes are available for this class of service, depending upon the material handled and the volume of air consumed, ranging from 4½ to 11 cu.ft. of air per minute. For the pressure-feed system, there are four sizes available with air consumption varying from 4½ to 13 cu.ft. per minute.

Federal Grease-Sealed Bearing

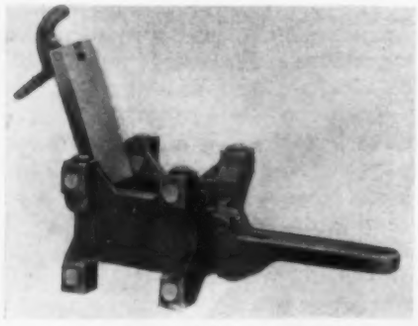
An all-metal grease-sealed bearing has been developed by the Federal Bearings Co., Inc., Poughkeepsie, N. Y. There is no frictional contact between rotating parts and therefore no rise in temperature or overheating at any speed. The efficiency of the seal is achieved by mechanical means. The inner impeller and outer seal form a vacuum pocket, preventing suction of foreign matter into the bearing. The impeller continually throws grease into the races and onto the balls where it is required and the vacuum retains the grease. The impeller is securely pressed on the inner bearing ring and the outer seal is

spun into a recess in the outer race ring. Standard S.A.E. dimensions are always maintained and consequently no distortion in mounting is involved.

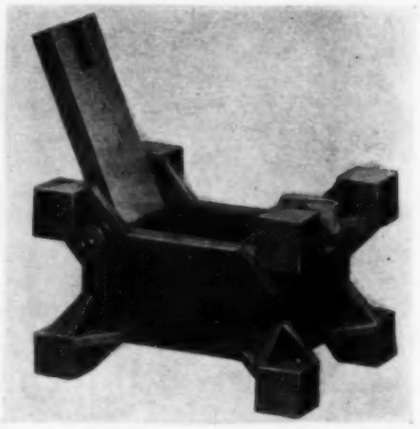
Siewek Box and Leaf Jigs

The Siewek Tool Co., 10232 Woodward Ave., Detroit, Mich., has augmented its line of rapid-clamping drill jigs, fixture locks, and drillheads by the addition of a complete line of box and leaf jigs. The leaf jig is of the handle type, with a cam for locking the lid, and drilling can be done from all four sides. The body is of aluminum with steel rest buttons on the feet. The box jig is of a conventional type with a jig lock screw for clamping the lid, and drilling can be done from six sides. The body of the box jig is of semi-steel.

Both the box and leaf jigs are suitable for use on low production jobs, although they have been found suitable on high production jobs as well. The sizes manufactured will meet practically all requirements, but special sizes can be supplied.



Siewek Leaf Jig of the handle type, in which drilling can be done from four sides

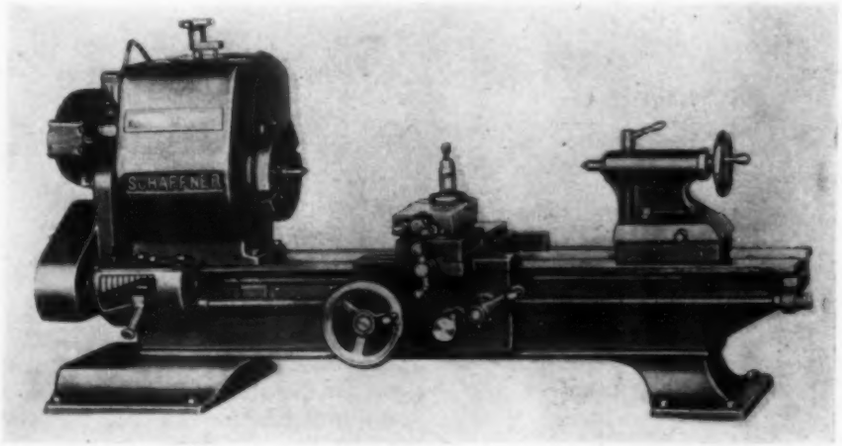


Siewek Box Jig in which drilling can be done from six sides of the semi-steel body

Schaffner Models B & C Engine Lathes

Two engine lathes for manual-training service are being offered by the General Radial Drill Co., 1767 Elmore St., Cincinnati, Ohio. The model "B" machine is made for metal-working and the model "C" for woodworking. Both machines employ the patented Gibbs V-disk transmission.

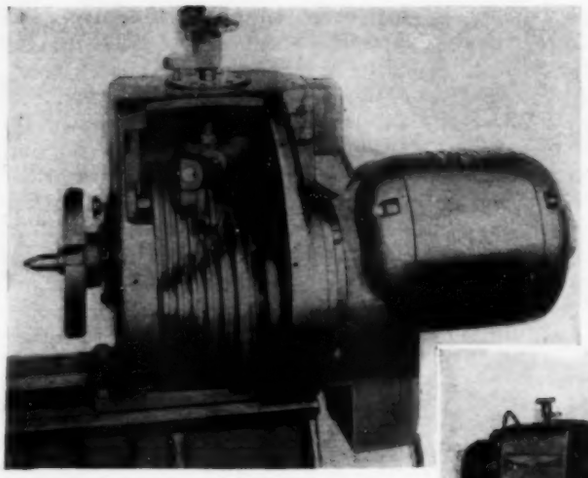
The model "B" machine is of 11¼ in. swing and is made in 4, 5 and 5½ ft. bed lengths in either the bench or floor type. Inclosed head



Schaffner Model "B" Engine Lathe for manual-training, having a swing of 11¼ in. and using a Gibbs V-disk transmission

design is employed. The motor is built-in and drives the back cone, this cone in turn driving the spindle cone through a Gibbs disk mounted as an idler between these cones. A star knob mounted on the top of the head controls the speeds. This knob is lifted upward until the dowel pin is clear of the hole and is turned to the hole marking the desired speed. The six spindle speeds range from 67 to 580 r.p.m. Ball bearings are used exclusively in the head and the spindle runs on angular contact bearings which are adjustable for wear. The spindle has a ⅞-in. hole through its entire length.

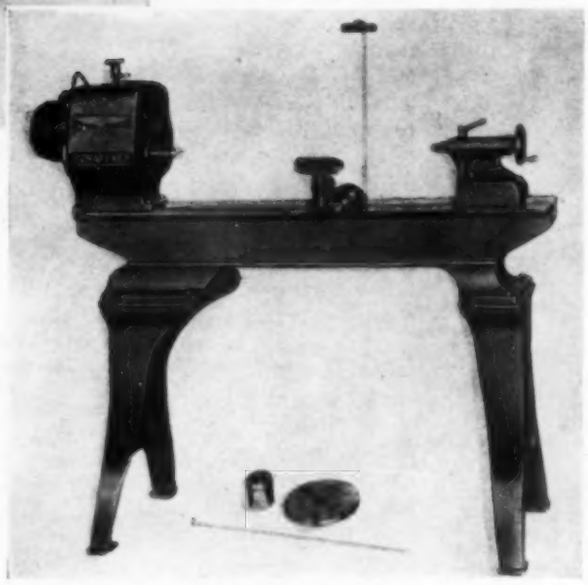
Forty thread changes are available. The compound may be swiveled to any angle and the tailstock may be set over. Standard equipment includes the motor, switch, electrical connections, small faceplate, two centers, headstock center sleeve, toolpost complete, thread chasing dial,



Close-up of the Gibbs V-disk transmission used in the model "B" and "C" lathes

wrenches and an instruction sheet.

The model "C" machine is a speed lathe for woodworking, but the speeds are much higher than for the model "B" machine. The swing over the bed is 12 in. and the bed lengths available are 4, 5, 5½ and 6 ft. The motor is of ½ hp. capacity and is built into the head to give six spindle speeds from 600 to 3,000 or from 400 to 3,400 r.p.m. The Gibbs V-disk transmission is also used in this machine in connection with a constant-speed motor, and the speed changes are made in the same manner as on the model B.



Schaffner Model "C" speed lathe for woodworking, having a swing of 12 in.

Taylor Forged Seamless Steel Fittings for Welding

The Taylor Forge & Pipe Works, Chicago, Ill., has developed a complete line of seamless steel pipe fittings for welding, consisting of elbows, tees, reducing tees, bull plugs, reducing nipples, and butt-welding flanges. All sizes up to 24 in. inclusive will be manufactured, but sizes to 12 in. are now available. The tees are made in sizes from 2 to 8 in.

This line of seamless pipe fittings permits the entire pipe system to be fabricated by welding by the use of true circumferential welds, which are the easiest to make, result in best efficiency of the welder, and give full strength welds. The fittings are lighter in weight than cast-steel fittings, and require fewer and lighter supports. They require less space in erection and permit easy and economical insulation. The elbows are made without thinning or buckling of the walls, and have the advantageous feature of short tangents to facilitate welding and accurate lining up. Elbows are made of the standard center to end measurement of the American standard extra-heavy screwed fittings, and with end to center to end dimension equal to one and one-half times the nominal pipe diameter. The ends are machine tool beveled and provide a smooth, clean surface for welding.

The forged tees are a tubular product made to pipe thickness at the ends, with the body thickened up especially around the outlet to give required reinforcement. The basis of design for the tee, as well as the other welding products, has been to make the fittings of an installation of welded fabricated pipe the strongest parts of the line. The tees have sweep outlets, a feature of importance for lines of high velocity.

The reducing nipples are designed especially for welding, with the length sufficiently long to aid installation, but shorter in dimension than that of the screwed reducing nipple. The butt-welding flanges, permitting insertion of valves in welded pipe installations, have a long fillet.

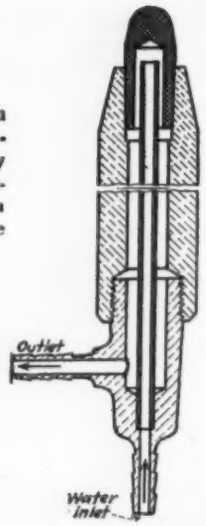
"Elkaloy" Spot and Seam Welding Electrodes

For low-speed and foot-operated resistance welding machines, an electrode material known as "Elkaloy" has been developed by P. R. Mallory & Co., 3029 East Washington St., Indianapolis, Ind. Unlike "Elkonite," a tungsten-base material developed by the General Electric Research Laboratories and marketed by the Mallory company, Elkaloy is a copper-base alloy of moderate price. Elkonite is still sold for high-production welding where the severest service conditions are met, but for the general class of work, Elkaloy is offered as a substitute for copper on the basis of a longer production life.

On spot welding operations, particularly on hand-operated machines, and also on seam welding, a die life of five times that of copper is claimed. In seam welding of coated material, such as terne plate or galvanized steel, Elkaloy does not pick up scale and coating as readily as copper, and hence the die need not be re-dressed as frequently.

Elkaloy is made in several grades.

Representative Taylor Forged Seamless Steel Fittings for welded pipe lines



Section through a typical water-cooled Elkaloy Spot Welding Electrode held with a taper fit in the holder

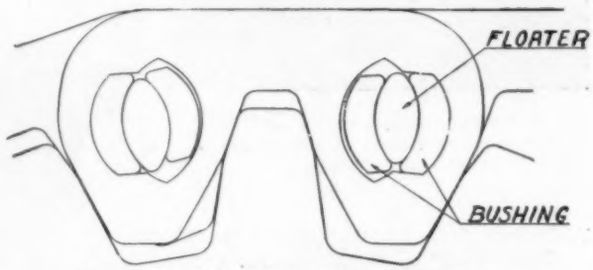
The hardness can be varied from 60 to more than 100 on the Rockwell B scale, or 300 Brinell. With increased hardness, the conductivity drops from a maximum of 90 per cent of that of copper, but this range still makes direct substitution possible without changes in the electrical elements of the welding machines. At the temperatures of the average water-cooled electrode, the material does not anneal and hence does not readily mushroom out. It is sufficiently economical so that the entire replaceable electrode is Elkaloy, instead of being in the form of a small tip as is usual with the more costly Elkonite.

Morse "Pumpkin-Seed" Chain

For providing smooth power transmission by chain, or in other words constant angular velocity of the driven shaft, the Morse Chain Co., Ithaca, N. Y., has developed what is known as the "Pumpkin-Seed" chain, especially for grinding machines and other machines requiring high precision and no chatter marks on the work. Ordinary chain drives will not provide a constant angular velocity because the sprockets in effect are polygons and the chain a series of flats, thus causing a slightly pulsating pull and a rising and falling motion of the open strands of the chain. To obtain uniform angular velocity by means of a chain drive, it is necessary to provide a chain joint, which when flexing on a sprocket, has its center of articulation follow the sprocket polygon rather than the pitch circle. In the Pumpkin Seed chain this is accomplished by the lenticular center-pin and the bushings, by means of which it is possible to provide two centers of articulation. These centers are so located that the joint will articulate around one center, which moves along the sprocket polygon through the first half of flexing, and around the other center, which also moves along the sprocket polygon through the latter half of the flexing. The forward end of the approaching link is caused first to drop below the pitch circle and then rise to it, thus carrying the oncoming strand of chain without the rising and falling motion common in other chains. In this action compensation is obtained for the difference between the circular pitch and chordal distance by the curvature of the pin and a steady pull is thus maintained constantly.

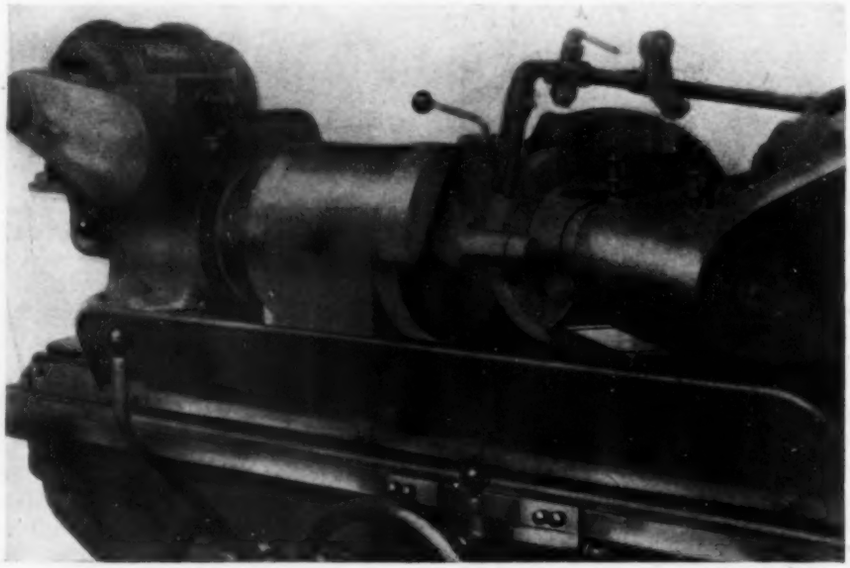
For absolute pitch compensation, a different pin would be required for each number of sprocket teeth. The amount of compensation necessary for correct action is, of course, more on sprockets having a small number of teeth than on those having many. A pin contour was therefore adopted which adequately compensates on the average number of teeth commonly used in small sprockets and which substantially does so within the limits of approved drive design. As the number of teeth increase, the polygon approaches the circle and the need of compensation diminishes.

Tests of this Pumpkin-Seed chain



Morse Pumpkin Seed Chain showing unflexed and fully flexed positions of pin, bushings and links at the start and end of flexing. Rotation counter clockwise

Morse Pumpkin Seed Chain showing position of pin, bushings and links at point of half flexing. Rotation counter clockwise



Morse Pumpkin Seed Chain is used for the workhead and wheelhead drive, of this Cincinnati Grinder

under standard conditions on a standard grinding wheelhead shows the performance of the chain consistently equalled the best obtainable by means of other transmissions. A trial was then made with a chain punched long in pitch to determine the performance that might result from a badly worn chain. This chain gave results equal to the other chain, showing that the quality of work on precision machines can be maintained during the life of the chain.

Other features of the chain are quietness in operation, long life, flexibility, ease of installation, adaptability to center distance, no slip and capacity for overload. The chains at present are being used on precision grinding machines and milling machines.

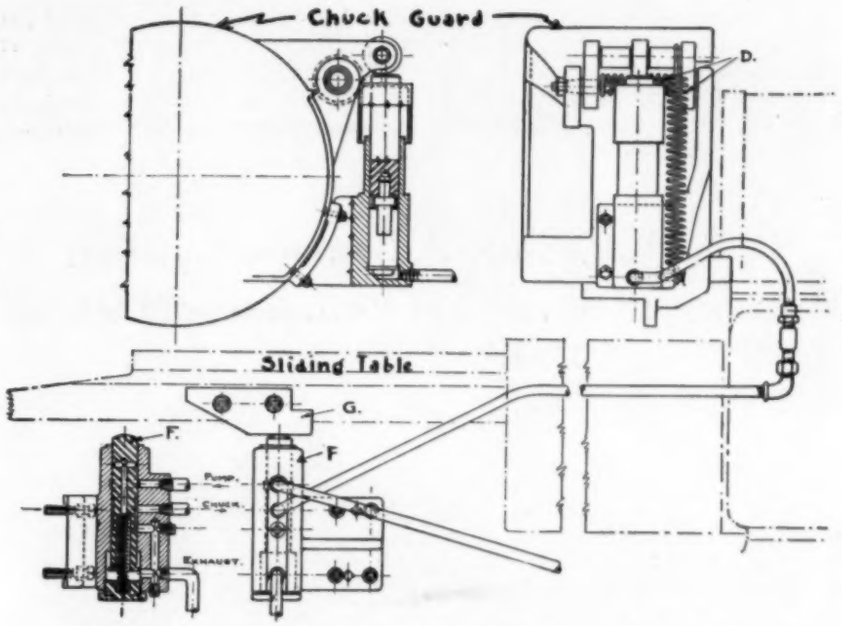


Fig. 2—Sketch of operating means of the Heald Automatic Chuck Guard for side-loading fixtures

Attachments for Heald Grinders

On high-production internal grinders, the Heald Machine Co., Worcester, Mass., has endeavored to furnish fixtures which load from the front, so as to obviate the necessity for opening the chuck guard each time a piece is loaded. In some cases, however, side-loading balloon-type fixtures are furnished either through necessity or on account of a distinct preference on the part of the customer. Production suffers because of the increase in handling time due to necessity for opening and closing the chuck guard. To eliminate this loss in time and to effect a saving in the cost per piece in this type of work, the company has developed an automatic chuck guard as illustrated in Fig. 1, which is applicable to all Heald No. 72A internal grinders where a standard guard is used. The guard can be readily applied to machines already in the field.

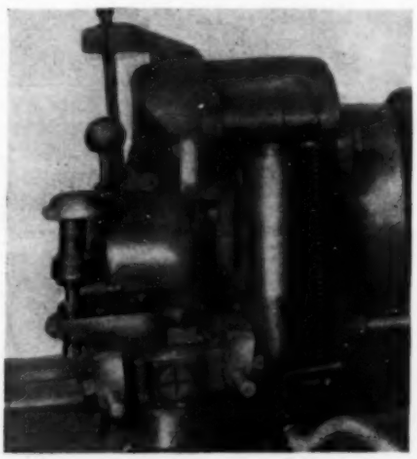


Fig. 1—Automatic chuck guard applied to Heald Internal Grinder for side-loading-type balloon fixtures

Referring to Fig. 2, the operating means consists of a valve *F*, a cam *G*, and an oil cylinder on the back of the chuck guard. The valve *F* is normally held open by a spring, allowing hydraulic pressure to be exerted against the piston. This holds the guard closed against the pressure of the springs *D*. When the table runs out to rest position, the valve is depressed by the cam *G*, allowing the oil to exhaust from the cylinder and the springs *D* to open the guard. Reversal of the table and release of the valve *F* allows pump pressure to close the guard automatically.

Fig. 3—Mechanism for neutral position of workhead spindle of Heald Internal Grinders

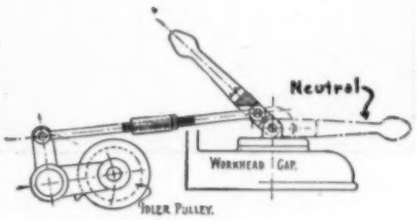
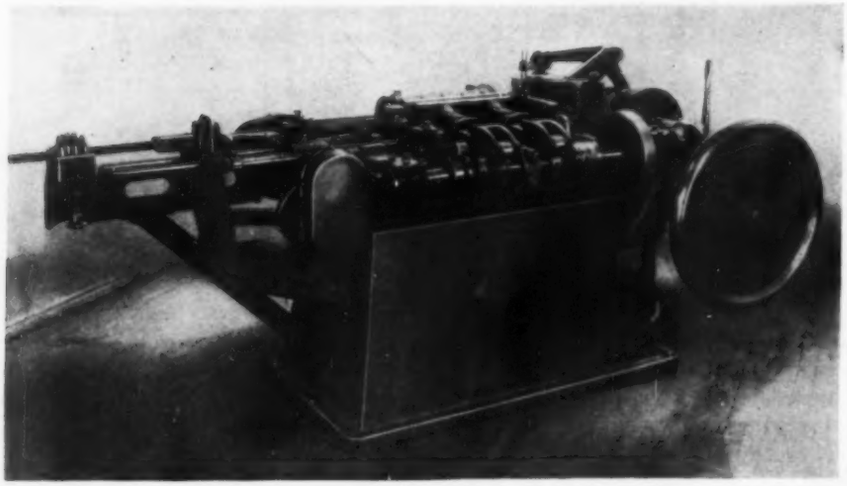


Fig. 4—Arrangement of lever for slacking workhead belt idler to permit workhead spindle to turn freely when setting up the machine

A neutral arrangement for the workhead spindle has also been developed by the Heald company. The ability to free the workhead from its driving mechanism, so it can be turned by hand, is of value in setting up the machine, and is almost a necessity when balloon-type fixtures are employed. This attachment is rapid to operate and is simple in construction, as shown in Fig. 3. It consists of a lever coupled to the arm carrying one of the workhead belt idlers in such a way that pulling

the lever outward and downward slackens the belt sufficiently to allow the workhead spindle to turn freely. The hand lever is mounted so that it goes beyond center, holding the idler down against the tension of the idler spring. The construction is made clear by Fig. 4. This type of neutral is applicable only to the motor-driven No. 72A grinders.

U. S. Multi-Slide Automatic Cutting, Forming, Piercing and Embossing Machine



A general-purpose, high-speed automatic machine known as the "Multi-Slide" has been brought out by the U. S. Tool Co., Inc., Ampere, N. J., for low-cost production in the manufacture of light and medium-size metal stampings. A large variety of parts can be produced from brass, steel, phosphor-bronze and other metals in a wide range of widths and thicknesses. Blanking, forming, piercing, embossing and cutting-off operations are performed accurately on coiled stock at production rates up to 300 pieces per minute.

From a reel, the stock passes between vertical straightening rolls to a reciprocating feeding mechanism which is a positive feed operated by a crank having an adjustable throw. Beyond the feeding jaws, a cam-operated clamp holds the stock in position in the die during the reverse movement of the jaws and while the tools are in operation. The cutting die is a complete unit that is easily interchanged for different work. Cutting-die units have as many stations as are required to perform the operations.

After the stock has been advanced from the cutting die, forming tools, operated by cams, shape the part. The forming operations are completed in one location, as the forming tools may be set to operate in any direction to suit the particular part. The stock is held positive in every position.

This machine is made in four sizes, including one bench and three floor-types.

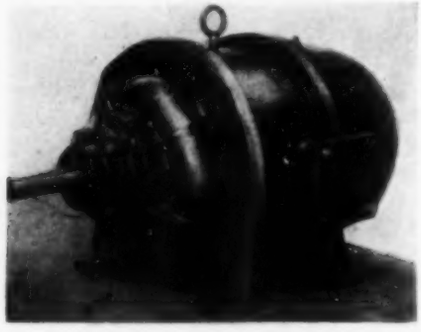
"Cee Bee" Cleaning Compounds

Highly concentrated active cleaning compounds are being announced by the Cee-Bee Laboratories Ltd., 655-657 E. Gage Ave., Los Angeles, Calif. These compounds are offered for use for all industrial cleaning problems and are claimed to contain no harmful ingredients. The compounds are strictly physical agents and do not combine with oil, grease or any foreign matter. They clean by deflocculation of solids and the emulsification of liquids and may be applied by hand, by emersion, by pressure gun or through circulation. The compounds are sold in containers holding from 1 to 600 lb.

Westinghouse Totally Inclosed Fan-Cooled Motor

For use in explosive atmospheres, a totally inclosed fan-cooled squirrel-cage motor has been developed by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. This motor meets with the latest specifications of the National Board of Fire Underwriters for use in Class I, Group D, hazardous locations.

Free passage of cooling air is assured because of the large air passages and large spaces between the guard and the non-sparking aluminum alloy fan. The bearings are of cartridge type and have low maintenance and long life due to their location on the outside of the bearing bracket where the heat is dissipated in the cool air steam. The prewound primary core is interchangeable and



renewable. The heavy conduit box is so designed that it may be turned in any direction to receive conduit. These motors operate efficiently either indoors or outdoors.

"Liquilox" Protective Coating

A protective coating which may be applied by gun or by brush to hot or cold surfaces has been announced by the Liquilox Co., Ltd., 576 Subway Terminal Bldg., Los Angeles, Calif. This protective coating contains no dyes, lamp black, rosin, asphalt, gilsonite, vegetable or animal oils, and offers protection against all acids, alkalies, salts, and indirect heats from 1,400 to 1,500 deg. F. It is for application to woods, fabrics, metals and stone. This coating is said to be a product manufactured from an ore and is held in suspension in a special thinner. The color available is black,

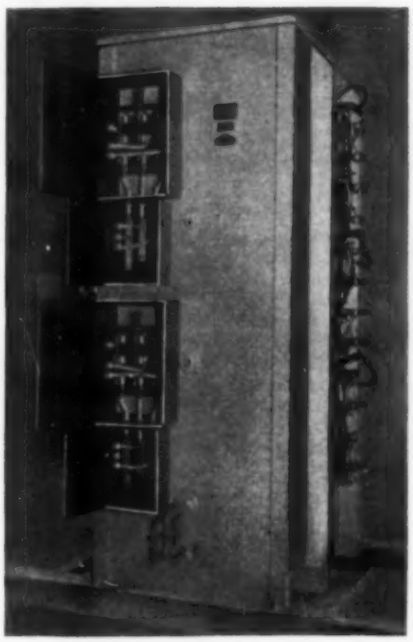
although other shades ranging mostly to variations of bronze are available on special order. The drying time is about four hours dust-free and several additional hours for complete hardening.

Tables for Société Genevoise Micro-Indicator Stand U-3

A modification of micro-indicator stand U-3 is being offered by the Société Genevoise d'Instruments de Physique through the R. Y. Ferner Co., Investment Bldg., Washington, D. C., American agent. The modification utilizes a V-block as the table, adapting it to the support of small cylindrical pieces from $\frac{1}{8}$ to 2 in. in diameter. Larger pieces up to a maximum of 6 in. in diameter can be checked on a large flat table of $4\frac{1}{8}$ in. diameter. This table is case-hardened and lapped and is provided with cross grooves to eliminate dust on the surface and provide for a good contact with the standard flat gage blocks when they are wrung onto it to establish the zero setting of the instrument.

An adjustable square is also furnished for attachment to the column of the stand, which serves as a stop piece against which cylindrical test pieces can be rolled to the correct position for reading on their diameters. The micro-indicator used in these measurements has adjustable tolerance marks which can be set at any desired point up to 0.003 in. either side of the zero. The indicator is also provided with a lifting clip by which the contact plunger can be raised for the insertion of the workpiece beneath the spherical or flat contact anvil without the necessity of rolling or sliding the piece under the anvil each time with resulting wear of the contact surface. These facilities make rapid inspection of parts an easy matter.

The micro-indicator can be supplied graduated to 1/2,000 to 1/5,000, 1/10,000, or 1/20,000 in. per division, according to the grade of accuracy demanded. The instruments are guaranteed to read accurately to one per cent of the total range of the dial, which varies from 0.02 to 0.06 in. according to the manner of graduation.

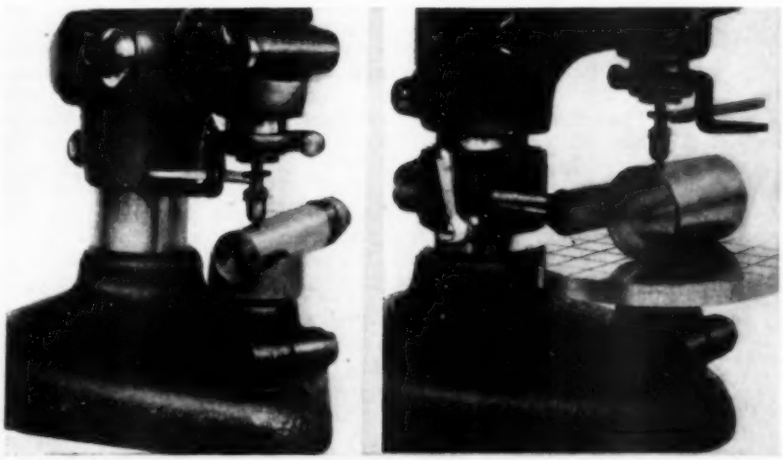


Broaches are heat-treated vertically in this electric furnace

"American" Vertical Electric Heat-Treating Furnace

A vertical electric heat-treating furnace recently shipped by the American Electric Furnace Co., 27 Von Hillern St., Boston, Mass., to the Autostroy plant in Russia, is illustrated. This furnace is designed for heat-treating broaches at temperatures up to 2,500 deg. F., and has Globar-type heating elements. The effective heating chamber is 8x12x72 in. deep, and the outside dimensions are 3x4x10 ft. high. The rating is 100 kw., 220 volt, 3-phase, 50-cycles. To obtain a uniform temperature throughout the interior of the furnace the heating elements are connected for three overlapping heating zones with two control instruments. Twenty-four Globar elements are employed, each with two water-cooled terminals, and each terminal is fitted with a visible water drain. To eliminate oxidation, scaling or pitting of the work the furnace is equipped with a patented atmospheric control.

The furnace is to be set into a pit leaving the top approximately 18 in. above the floor level, and an electric hoist traveling on rails is to be used for carrying the broaches from the preheating furnace to the high temperature furnace, and then into a lead quenching bath.

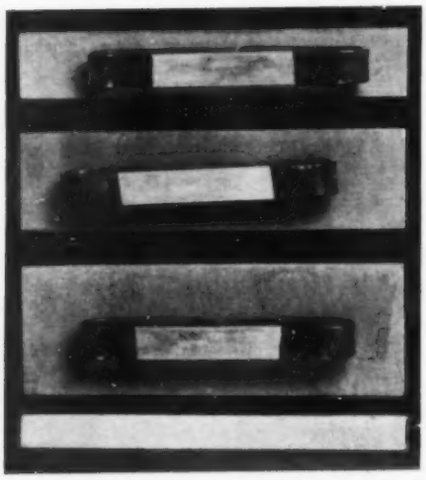


Left—V-block table for pieces to 2 in. in diameter. Right—Flat table for pieces to 6 in. and also the adjustable square

"Production" Surfacing Files

For filing flat, true surfaces the Production Engineering Co., N. 1317 Maple St., Spokane, Wash., is now producing a surfacing file made of a special alloy steel. This file is of use in manufacturing and repair work and can be moved across the work like a plane or held in a vise with the flat side of the file upward so that the work may be drawn across it. When desired however, the file may be fastened to a bench and the work drawn over it. These files are made in three sizes: 2x12, 3x12 and 4x12 in.

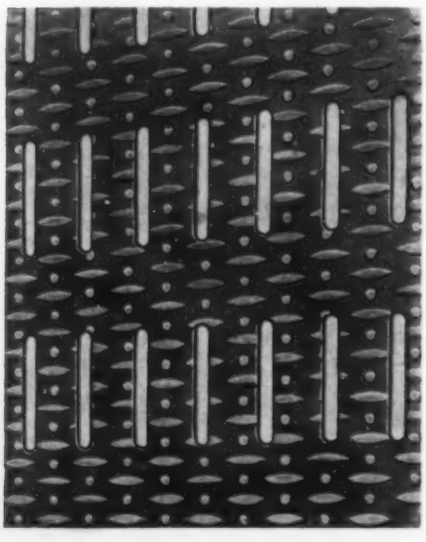
A "Super Service" file or "safe



maker's" file with parallel edges is made in a 12 in. length only. The teeth of the file have a positive rake and a rounded gullet, and for this reason can be used on soft material such as babbitt and aluminum, as well as for harder materials.

"Central" Slotted Floor Plate

A non-skid floor plate is being offered by the Central Iron & Steel Co., Harrisburg, Pa., for use where floor gratings are ordinary applied. This grating is non-skid in all directions and because of its basic design, it requires no deep recess or rabbet in which to be set. It is furnished in almost any gage and size up to 72x240 in. No expensive and complicated supporting structure is required. The plate allows free ventilation, free drainage, passage of light and also has reduced weight.



TRADE PUBLICATIONS

CHAIN. The Morse Chain Co., Ithaca, N. Y., is now distributing bulletin No. 41 on its "Pumpkin Seed" chain. The bulletin gives drawings and photographs of applications to grinders and milling machines.

GEARS, SILENT TYPE. The Continental Diamond Fibre Co., Newark, Del., has issued a booklet entitled "Celoron Gears," which lists the properties of Celeron silent gears and shows many applications to both high-speed and low-speed machinery. Recommended practices for machining and general gear information are appended.

HAND TRUCK. The Howe Chain Co., Muskegon, Mich., has issued book No. 129 describing its improved "Jak-Tung" truck for hand or trailer use. A number of typical body forms for this small truck are illustrated as well as general constructional details. A price list is appended.

INSULATING MATERIAL. The American Lava Corp., Chattanooga, Tenn., has issued Catalog No. 32 on lava and magnesia specialty insulation for electrical and mechanical uses.

MOTORS. The Century Electric Co., 1806 Pine St., St. Louis, Mo., has issued a folder on Type RS repulsion start induction single-phase motors of the brush lifting type. Complete constructional details are included.

MOTORS. The General Electric Co., Schenectady, N. Y., has issued Bulletin GEA-1406 on Type SCR explosion-proof, totally-inclosed, fan-cooled single-phase motors for Class 1, Group D, hazardous locations.

MOTORS. The Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is distributing leaflet 20525 on Type MC mill motors of d.c. design for application to heavy-duty mill equipment. These motors embody the latest recommendations of the Association of Iron and Steel Electrical Engineers.

MOTOR BASES, FLOATING-TYPE. The Kritzer Co., Chicago, Ill., has issued a data book of specifications, applications and dimensions compiled on its floating motor-drive base, which is manufactured in sizes up to 50 hp. Many diagrams and drawing are included to illustrate the principle of this floating drive and its application in various mounting positions.

ROLLER CHAIN. The Diamond Chain & Mfg. Co., Indianapolis, Ind., has issued the fifth edition of Catalog No. 57 on its roller chains and sprockets. For the first time specifications on 2½-in. pitch chains and sprockets are given, and a number of photographs of applications have been added. Considerable engineering data are included.

STRAIGHT BEVEL GEARS AND GEAR GENERATORS. The Gleason Works, 1000 University Ave., Rochester, N. Y., has published an 8-page pamphlet on straight bevel gears and gear generators, giving information on the machining of the blanks and full constructional details of the generating machines manufactured.

PATENTS

SEPTEMBER 1, 1931

Processes

Method of Cleaning Galvanizing Pots. Frank L. McMeans, Apollo, Pa., assigned of one-half to Philip B. Doverspike. Patent 1,821,105.

Bearing Sleeve and Method of Making Same. Berger Stockfleth, Niles, Mich., assigned to Hydraulic Pressed Bearing Co. Patent 1,821,122.

Method of Finishing Gears. Frederick E. McMullen, Rochester, N. Y., assigned to Gleason Works. Patent 1,821,188.

Tools and Attachments

Abrasive Testing Machine. Harley H. La Vercombe, Detroit, Mich., assigned to Abrasive Engineering Corporation. Patent 1,821,169.

Wire Bending Die. Sten Wadsten, Bloomfield, N. J., assigned to Westinghouse Lamp Co. Patent 1,821,249.

Tailstock. Ernest J. Svenson, Rockford, Ill., assigned to Sundstrand Machine Tool Co. Patent 1,821,331.

Micrometer Calipers. Robert J. O. Simpson, Athol, Mass., assigned to The L. S. Starrett Co. Patent 1,821,398.

Toggle Press Guard. Frederick H. Kunkel, Milwaukee, Wis., assigned to Geuder, Paeschke & Frey Company. Patent 1,821,651.

Metal-Working Machinery

Machine for Manufacturing Bushings. George F. Yager, Toledo, Ohio, assigned to The Bunting Brass & Bronze Co. Patent 1,821,199.

Riveter. James J. Taylor, Wyoming, Ohio, assigned to The Stacey Bros. Gas Construction Co. Patent 1,821,410.

Metal Flanging or Cutting and Flanging Machine. Ned T. Willis, New York, N. Y. Patent 1,821,457.

Barb Wire Machine. William H. Sommer, Peoria, Ill. Patent 1,821,730.

Furnaces

Furnace Hearth. George C. McCormick, Needham, Mass., assigned to General Alloys Co. Patent 1,821,658.

Hardening Furnace with Continuously Operating Charging Device. Ernst Goerig, Mannheim, and Heinrich Lindhorst, Berlin, Germany. Patent 1,821,832.

Reference Book Sheet

METAL-CLEANING TANKS

CLEANING tanks are commonly made of steel, either riveted or welded. These serve for alkaline cleaning solutions. Steel tanks are rubber and lead-lined for handling pickles. Stoneware and vitreous enameled tanks are also commonly used for acid solutions, except for those containing hydrofluoric acid. Wooden tanks are suitable for rinses. When pitch-lined they may be used for cold acid solutions.

The shape and size* of tanks is a matter of individual requirement. Tanks should be sufficiently large to handle production readily. Tanks which are small become fouled too quickly. If there is not a sufficiently large volume of solution present to hold dirt in emulsion, it may be re-deposited on the work as it is removed.

The heating of the tank and the arrangements for emptying and cleaning are two vital factors. Gas or oil firing is often used for tank heating and is quite suitable. Electric immersion heaters are also finding some use. The closed steam coil is, however, more generally used.

Steam coils rather than live steam are preferable for heating, as condensate from the latter rapidly dilutes the solution. The steam coil should be placed at the back of the tank—the side away from the workmen. The solution, boiling up, rolls toward the front of the tank carrying surface scum and oil over the dam, leaving a clear surface out of which the worker lifts the cleaned pieces. Equivalent results may be obtained with the coil in other positions, if lack of draft causes troublesome steaming.

The coil should never be on the tank bottom. If there, it becomes insulated with sludge and makes cleaning of the tank difficult. Plenty of coil area should be available for quick heating. A large volume of cold metal passing through a cleaning tank cools it rapidly.

Use the accompanying table of pipe sizes and lengths for heat coils for calculating heating coil dimensions. The figures give the number of linear feet of pipe to heat one gallon of water from room temperature to boiling in one hour. For example—suppose it is desired to bring to a boil in one-half hour a tank holding 420 gal. The pipe used is 1¼ in. and steam pressure available is about 50 lb. Table figure for 1¼ in. at 50 lb. is 0.10.

$420 \times 0.10 = 42$ ft. to heat in one hour. To heat in ½ hr. will take twice as much pipe or 84 ft. To heat in ¾ hr. would take 4/3 as much pipe or $4/3 \times 42 = 56$ ft. The accompanying graph gives these data in more convenient form.

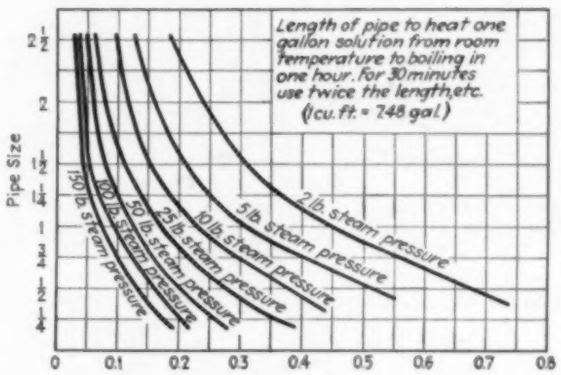
The "Agitation Shield" is an excellent means of securing vigorous agitation in large vats. It also serves as protection for the steam coils against heavy objects. A surface drain or dam placed at one end, or at the back, is a great advantage. By occasionally running in water to raise the solution level, surface scum will overflow, thus keeping the surface of the solution clean.

In very large vats, such as are used for railroad cleaning, etc., a floating block of wood serves as a nucleus and center for the floating oil. By pushing it aside, a clear surface can be made through which to withdraw work.

A bottom draw-off for flushing out is a necessary fitting. Where the work brings in a large amount of muck, a false bottom which can be hoisted out for cleaning, will prolong the life of the solution. In other cases, a wire screen or perforated metal false bottom is a valuable aid in recovering lost parts which have fallen to the bottom. A bucket set on the tank bottom and occasionally fished out and emptied serves as a simple but excellent dirt trap.

Small detachable dams or skimming troughs that can be hung in any tank are easily made from sheet metal.

*Capacity in cubic feet is figured by multiplying the number of square feet the base covers, by the depth. With rectangular tanks width × length × depth in feet equals cubic feet contents. For cylindrical tanks, the area of the circular base equals radius × radius × 3.142 sq.ft. This times depth (in feet) gives cubic feet. Cubic feet times 7.5 gives gallons capacity. One gallon of water (or dilute solution) weighs 8.5 lb. (approximately).



Pipe Sizes and Lengths for Heating Coils

Heating Time, Room Temp. to Boiling	Pipe Diameter	Steam Pressure in Coils: 5	10	25	50	100	150
One Hour	¼″	.56	.41	.30	.23	.17	.14
One Hour	⅜″	.42	.31	.23	.17	.13	.10
One Hour	½″	.35	.25	.18	.13	.10	.08
One Hour	¾″	.25	.19	.14	.10	.075	.061
One Hour	1″	.22	.16	.12	.087	.064	.052
One Hour	1¼″	.17	.13	.09	.068	.050	.041
One Hour	1½″	.14	.11	.076	.057	.042	.034

Pipe Sizes and Lengths for Heating Coils

It is frequently advisable to use a two-tank system for cleaning. The first tank removes most of the dirt; the second is then able to give a chemically clean surface which will not require undue rinsing. The two-tank system allows the solution to be used longer, as the first tank may be loaded much more heavily with dirt than if it were used alone. When this solution is discarded, the solution in the second tank is then transferred to the first tank and a fresh solution made up for the second tank. Where the first tank is a soap tank and the second tank contains an alkaline solution, they must, of course, be kept in this order. The counter-current system is highly efficient and its use is recommended where space and available equipment permit.

Agitation is an invaluable aid in most cleaning operations, particularly with recessed parts, or where solid-particle-dirt is caked on—as buffing compound, burnt-on-oil, muck on motor or engine parts. Agitation is essential for speed cleaning. Lively boiling is the simplest form of agitation. This requires plenty of coil surface and good steam pressure. To be effective, ebullition must be violent.

Compressed air may be used for agitation by running one-half inch pipes across the tank about 6 in. above the bottom. These should be drilled with 1/32-in. holes every two inches, with the holes pointing downward at a 45-deg. angle. They must, of course, be closed at the dead end. This type of agitation should be used only when no other is available. It rapidly cools the solution and promotes foaming. Where easily tarnishable metals are being cleaned, the large volume of hot air passing over their surfaces hastens this undesirable effect. The following mechanical methods are much to be preferred.

The use of metal baskets, trays or racks with an overhead mechanical agitator—cam, eccentric, lever, or chain or pneumatic hoist—is the best practice. This not only facilitates the cleaning operation, but allows safe, convenient, mass handling. The tumbling barrel furnishes a unique form of agitation. For such work as can be handled in a barrel, either free or appropriately racked, this is a most efficient method of cleaning due to the combined physical action of the cleaning solution and the mechanical action due to tumbling. Propeller agitation has recently been successfully applied.

Abstracted from the booklet, "The Cleaning of Metal," by Robert W. Mitchell, Ph.D., published and copyrighted by the Magnus Chemical Co. A wide variety of practical information on methods of cleaning, suitably illustrated, is included therein.

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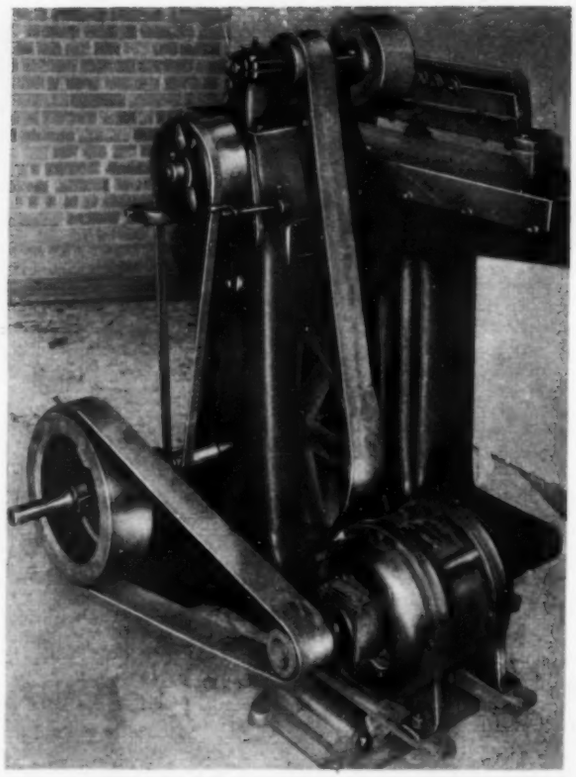
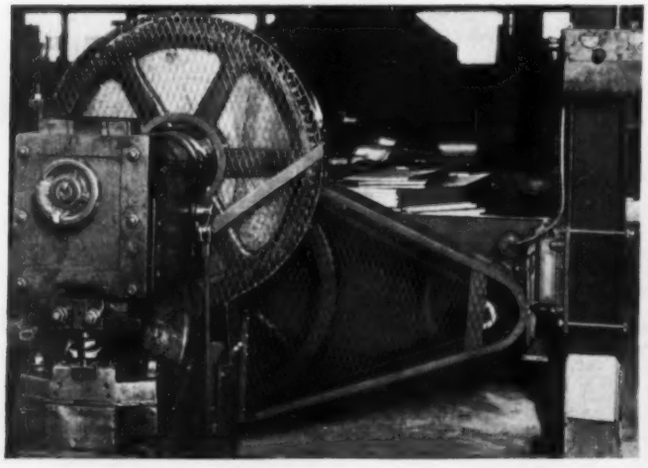
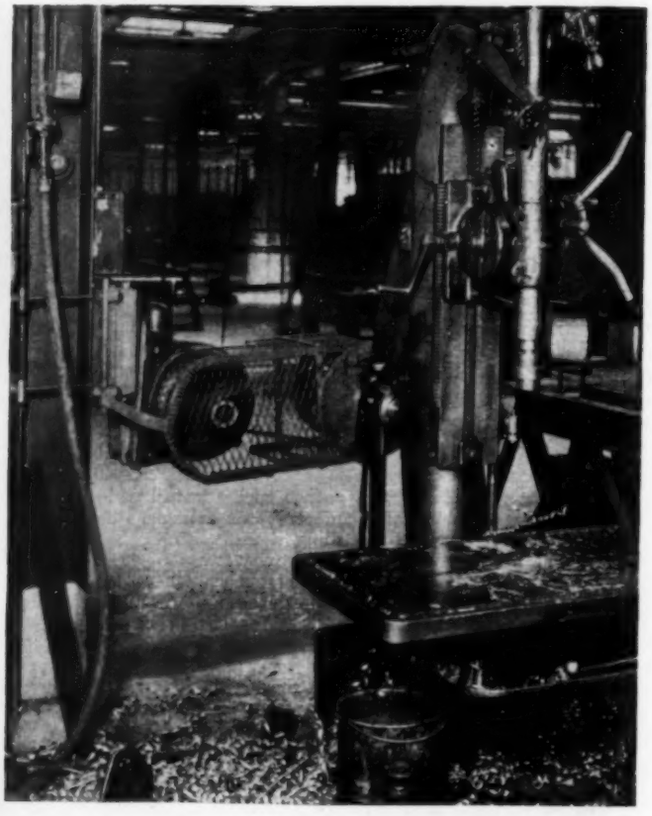
Flat Belt Short-Center Drives

WEIGHT of the motor itself is used to maintain correct belt tension at all motor speeds in the Rockwood-type short-center drive. [Right] A set-up on a knife grinder, with a 2-hp. motor running at 1,800 r.p.m. and center distance of 26½ in. Pulleys are 3 to 13 in. With a special endless belt, an efficiency of close to 99% is claimed, with long belt life, high overload capacity, and the ability to handle jerk or shock loads. [Below] Wall mounting on a metal punch, with a 3-hp., 1,200-r.p.m. motor, pulleys 4½ to 36 in. and center distances of 40 in. The drive may also be wall or ceiling mounted to drive lineshafts or machines, may be built into a machine, and will drive in either direction and at any angle except that the driven pulley shaft cannot be lower than the motor pulley shaft







[Above] Wall or vertical mounting of the drive on a drillpress with pulleys of 3 to 12 in. Six standard bases have been adopted to fit all motors to 50 hp. and maintain accurate speed in the driven pulley. [Left] Another floor set-up on a universal miller, with a 2-hp., 1,200-r.p.m. motor, pulleys 4 to 16 in., center distance of 2 ft., and a 3-in. single belt. As belt length increases with centrifugal force at high speeds, center distance is increased correspondingly. Adjusting screws in the base make up for belt stretch, increase belt life and permit speeds up to 7,000 f.p.m.

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, September 10, 1931

VOL. 75 NO. 11

Hammering Production Costs

Production costs are again being hammered by high executives in the automotive industry; lower costs are being demanded of parts makers for the larger builders of cars. Such may be difficult in view of decreased production and smaller opportunities to reduce overhead. Lower machining costs can only come from better machines, improved methods or lower wages. And direct labor plays such a small part in the total cost of such parts that any wage reduction is likely to be offset by decreased interest which frequently reflects itself in lowered output or quality.

New machines and new methods are available where production warrants the investment. They are the only satisfactory answer to the demand for lower production costs. And it might be added that investment in new machine equipment will also do its share toward making a wider demand for automotive products.

Quantity and Price

Those of us who recall the early days of the automobile will remember the high prices of accessories—horns, speedometers, windshields. As a matter of fact, however, there was more reason for the high prices than was apparent. The same reason holds good today in accessories for airplanes, for radios and for many other devices. And that reason is quantity.

We know of an airplane device similar in many ways to one used on automobiles, yet selling for about five times the cost of the one on the cheaper cars. Purchasers naturally compare the two and see abnormal profits for the maker. In reality the margin of profit is less. The cheaper device is made by millions instead of hundreds.

Development costs are practically the same whether you make one or a million. But it makes a tremendous difference whether you must spread this cost over a few or can distribute it, very thinly over a large production. And the cost of development is just as necessary and is just as legitimate a charge as are labor and material.

Every manufacturer whose output is limited to small quantities is handicapped in the same way. If his product goes to large quantity producers it is difficult for his customers to see why a dollar will not buy as much of the small quantity product as of their own. Purchasers of any product should consider the effect of quantity as well as of quality on the total cost before condemning any price as too high.

Mechanical Engineering Salaries

Rates of pay for mechanical engineers of all ages and in all parts of the United States are reported in a preliminary statement recently released by a special committee of the A.S.M.E. As might be expected, the statement is of historical rather than current interest so far as present salary scales are concerned. It reports rates as of 1930, the last year of what some people are beginning to call the Golden Decade. Salary slashes, five-day weeks and vacations without pay have wrought havoc with 1930 salaries.

But the report gives valuable data on engineering salaries received by men in different sections of the country, with varying types of education, and of different age groups. Generally speaking, it shows that the engineers with the best preliminary training rise to the highest levels in middle age although they may not earn as much during the first few years out of college. It also shows rather clearly that technical ability alone does not qualify an engineer for the jobs paying the really high salaries, the jobs where administrative ability and a capacity for handling men are essential.

What will happen to engineering salaries dur-

ing the next ten years is anybody's guess, of course, but there is every reason to believe that engineering planning for every sort of enterprise will be far more in evidence than the "rule of hunch" that served for so many companies when the boom was on. Engineering planning calls for trained minds, and a knowledge of business principles as well as of engineering fundamentals. The engineers who can offer this combination to business and industry will unquestionably command salaries that will compare favorably with the salaries of 1921-30. But the engineer who allows his technical interests to outweigh his business sense will probably not fare so well.

◂◂ CHIPS ▸▸

Best news of the week for machine tool builders . . . Lycoming Motors places big machine tool orders for complete Auburn Eight cylinder block line . . . orders also for unannounced new model . . . Buick, Chevrolet and Ford continue tool buying . . . Eight hundred million Treasury offering over-subscribed . . . capital sneaks from cover to snatch three per cent . . . Bendix and Indiana Standard Oil organize Lubrication Corporation to manufacture higher pressure fittings for automotive and industrial machinery.

Car loadings again gain during week ending August 22 . . . Chevrolet produced 54,958 units in August, as against 51,622 same month 1930 . . . Fourth successive month to show gain over last year . . . Oldsmobile up also . . . West Albany shops, New York Central, reopen . . . Association of American Washing Machine Manufacturers reports sales of 341,025 units for first six months against 319,229 for last year's like period . . . Middle West Utilities report gains in current consumption . . . Some one some place must be using it . . . Charles M. Gearing becomes general works manager, New Departure Mfg. Company.

Gifford goes forward with relief plans . . . Owen Young to have a swell new title, Chairman of the Committee on Mobilization of Relief Resources . . . But that does not make "Food for Starving Americans" sound any more American than it did . . . Green's appeals for the six-hour day and the five-day week become more insistent . . . Idea probably too obvious and untheatrical to be acceptable to this Administration . . . Bankers meet with Hoover to discuss help for real estate bondholders . . . Watch Wood and his urgings for Army and Navy budget cuts . . . Would be blow to metal-working industry . . . Mrs. Hoover reported to be urging wartime methods for peacetime emergency.

With fingers crossed and two rabbit's feet in his pants pocket, a certain manufacturer decided to abolish flat overhead and go to a machine center basis. On one large planer, the overhead jumped from one fifty per hour to seven something . . . scared the manufacturer. . . . He called in the superintendent who set the rate. He analyzed the figures and found them right.

As he was about to throw them out and stumble back to his old overhead rate, he saw figures proving that the planer was doing its real job of cutting metals only thirty per cent of the time. Seventy per cent went for setting up and repairs.

"Who sets up this machine?"

"Why, the operator and his helper."

"Next time that planer has to be set up, put six men on the job—sixteen if you can use them."

Now the planer is on the job, doing its real business of cutting around eighty per cent of the time.

Although it is another story which revolves around a new sales manager, this same manufacturer has just been compelled to go on a twenty-four hour, six day week basis. And, believe it or not, the manufacturer is a large machine tool builder.

One by one impediments to recovery are being pushed into limbo . . . Dogdays for example . . . and vacations . . . Still too close to Labor Day to see decided changes in business psychology . . . But one machine tool builder reports two of the largest orders for gear chamfering and gear burnishing machines ever placed . . . Detroit may be loosening up after all.

Bad as conditions are supposed to be in Europe, seven aliens left the United States in July for every three that came in . . . 7,428 against 3,174 . . . Austria, Hungary, Germany, Spain have all been helped with external loans . . . Now comes Bulgaria . . . Argentina seems to be next in line . . . Germany and Austria abandon proposed "customs union" . . . Some say Austria will be rewarded with further credits.

LAMENT

Several European countries are building Diesel-engined motor ships in considerable numbers, whereas the tonnage of motor ships built in our own country is negligible. Sixty per cent of all shipping tonnage laid down is to be powered with Diesel engines, and the new German pocket warship, "Deutschland," is to have 50,000 Diesel horsepower.

The point is that somebody has to build the engines for these craft, and it is disheartening to see European shops walking off with the lion's share of the laurels for building large marine Diesels.

Besides the engines themselves motor ships require a great variety of other equipment which American manufacturers could just as well build, if the ships themselves were only being constructed in American yards.

British Cabinet reported to have completed plans for drastic economies . . . Dole to be reduced ten per cent . . . Tariff in the offing and the rest of Europe shudders at the thought . . . German machine tool builders organize mutual acceptance organizations to discount Soviet bills . . . Plan to retain Soviet business which amounts to fifty per cent of their total . . . American builders and bankers continue apathetic concerning Russia . . . Millions of dollars lost through watchful waiting . . . Hoover and his Department of Commerce seem intent on out-Wilsoning Wilson . . . Mexico plans to ape Canada with tariff reprisals.

IMITATING IMITATORS

"Five Year Plans are flying about thick and fast, ranging in length from two to twenty years. We are approached daily by serious persons who inquire in an awed voice what we think of Russia and the Plan. The information about it seems to contain more adjectives than facts. Therefore our answer must be as vague as our information.

"Recently, someone stated that production in that country, is not yet up to that of 1917. It was said in a soft voice, almost a whisper. No one seems to have paid a great deal of attention to it. We are told that we are the model which Russia aspires to imitate. A little verse of Kipling's seems to apply here:

'They copied all they could follow,
'But they couldn't follow our mind:
'And we left them sweating and stealing,
'A year and a half behind.'

"Why is it necessary or even desirable to imitate our imitators?"—Francis J. Conway

THIS WEEK IN *AM*

Eleven major items appear on the bill. Thomas B. Frank leads off with an article which should have caught your eye as you thumbed through the issue, "Cutting the Cost of Cost-Keeping." Maintenance costs are troublesome things at best, and it will repay you well to turn back.

Without further ado or hesitation, "Grid Glow Micrometer" appears (page 407). It is through no fault of its author, R. W. Carson of Westinghouse Electric & Mfg. Company, that this ingenious contribution was postponed. If you are one of the many who have tried to mike soft rubber, or soft wire, and failed, here is a way.

Do all the good men wear white collars? Read the Foreman's Round Table this week and let your fellow readers of *AM* have the benefit of your opinions (page 408).

Just to show you how quickly a weekly publication can function, let us call your attention to "Flexible Welds in Metal Bellows" (page 423). Photographs arrived September 1; story was completed September 3; complete article appears in this issue of September 10. Every executive and operative is bound to want to know all the data on how flexible welds can be produced.

"Railway Repairs at Roanoke" (page 414). Here begins the first of a series of three articles on how the Norfolk & Western handles its shop work. "A Mirror Comparator," (page 417) another device to make precision inspection more precise. "Noise Elimination in the Shop," by E. S. Penn, one of the experts of Armstrong Cork, pioneer in the elimination of noise and vibration. "Metal Cleaning Tanks," a Reference Book Sheet for your data book (page 437). "Flat Belt Short Center Drives," gives four examples of money and belt saving installations.

• COMING •

Week after next comes the National Metal Congress and Exposition. Although many of our readers have stated that they will be among the 70,000 who are expected to attend, it is too much to hope that any man can be sufficiently mobile and hardy to take in the more important of the sixty or seventy papers. We have secured practically every one in advance. Thus in the issue preceding the Congress we are planning to publish the meat of the most important of them in running, easy-to-grasp form.

And we believe that we have found something fairly new under the sun—cold-treatment with "Dry-ice." If cold-treatment does not warm your imagination, you will be able to garner some fine points on heat-treatment in an excellent article on super high speed steel. "Ideas From Practical Men" will continue to carry material far in advance of one's ordinary conception of "shop kinks."

Chester Lord has uncovered certain new methods of handling high-chrome, or "stainless," steel. Time, trouble and good round dollars will be saved those who follow his suggestions. Welders cannot fail to be interested in the articles on various phases of the art. The issue of September 17 is one that you will want to keep near at hand.

Future issues will show how Grigsby-Grunow works in "tenths" on Majestic refrigerator parts. John Carmody, chief editor of *Factory and Industrial Management*, having just returned from several months in the U.S.S.R., will report first hand on "Men and Machines in Russia."

THE . INDUSTRY .

Progress in Metal-Working and Machinery Markets

LYCOMING'S big order for two complete production lines heads the tool news of the week. It includes tooling for the Auburn Eight cylinder block and for a new model engine. . . Other automotive buying includes some by Buick and Chevrolet scattered over the last month or two and an occasional special-tool purchase by Ford. . . Detroit is still uncertain, however, whether fall models will be radical departures or simply further refinements in body design and introduction of free-wheeling and similar engine elements which will require no additional tools. . . Tools and dies are being sold there, many for body work; tool and die shops and most motor plants are working nights for the first time in two years, and all good designers are now working. . . Confirmation of this statement comes from Budd in Philadelphia where the tool and die shop is working three 8-hour shifts while the production lines await the new tools.

NEW YORK, besides the information on Lycoming, has little to report. . . The Subway and Navy lists for 52 and 20 tools respectively are still being held up; inquiries are up a little. . . Chicago believes that the remaining months of 1931 will aid in bringing up the year's average, while inquiries remain fair and the used tool market slow. . . New England's tool market is pepless, with favorable developments in spots.

CINCINNATI thinks new inquiries have the earmarks of forthcoming orders, but business holds even, with only a several-small-tool inquiry from Kentucky to offer immediate promise. . . Southern District is likewise slow, although oil-field tool purchases show no curtailment as a result of Alfalfa Bill's militia. . . Buffalo reported July as the year's best month; August looks even better. . . Cleveland had an upturn in both sales and inquiries, with a school and an airport list.

NEW YORK

Lycoming has placed big orders for a complete cylinder block tool lineup for the Auburn Eight and a production lineup for a new model engine. It was divided between two or three companies. Buick and Chevrolet have been buying steadily, and Ford is taking an occasional special tool. Other orders were scattered and for replacements. The Navy 20-tool order is held up at least another week, and nothing definite has been announced as yet on the Subway 52-tool order, which will probably all go to one bidder, since that bidder must supply everything from machines to light bulbs. Inquiries have improved slightly, the usual number of single-tool Navy inquiries for yards all over the country predominating, with occasional municipal inquiries.

CHICAGO

Most tool representatives believe that the remaining months of 1931 will improve sufficiently to bring the year's average up to a more satisfactory level. Reports are current that a number of industrialists in the Middle West are taking stock of plant equipment with a view to having things in shape should the predicted pick-up materialize during the fall. While inquiries continue fair, they still are indefinite. Very few sales are reported, and such as are made are the result of persistent, unflagging drives on the part of those who go after them. No change is noted in the used tool market.

NEW ENGLAND

The machine tool market is without pep, and favorable developments have matured only in spots. Orders continue to be of the one-unit caliber. August was undoubtedly the worst month of the year for a number of companies, but industrial schedules have been maintained far better than expected. Foreign orders have been the salvation of grinding machine manufacturing centers, and with the automotive industry furnish the chief hope of builders for a more active fall season. No new inquiries of note have materialized.

DETROIT

It is still a matter for speculation whether the automobile manufacturers will bring out new models so radically different from the old ones as to start a flood of buying. For a time observers here believed the industry had many surprises up its sleeve and that the autumn changes would be altogether startling. Most automobile and accessory manufacturers will let their present machinery suffice unless they are absolutely forced to make expansions. Tools and dies are being sold now in a manner that gives some promise. Most new tools and dies are for body work.

For the first time in two years the tool and die shops and some motor plants are working nights. Body plants are particularly busy. Designers are busy in all shops. In some cases the designers are working nights and hardly any good designers are out of work.

CINCINNATI

That a larger portion of inquiries have ear-marks of immediate need of equipment and intention to buy without delay gives some machine tool manufacturers and selling agents hope that the market is thawing out, and soon will be fluid enough to permit orders to flow in more freely. An inquiry from the Kentucky Road Commission calls for several small tools, to be shipped to Pineville.

SOUTHERN DISTRICT

Machinery and machine tool sales continued bare of improvement. Stocks of new tools and equipment are kept low, while an excess of used stocks has accumulated. Sales are generally about the same, most transactions being for small tools. While there has been no reported curtailment of oil-field purchases as a result of the shut-downs in Oklahoma and Texas, there still lingers some doubt as to the possibilities. Railroad buying has been insignificant, while the shipyards continue inactive.

BUFFALO

No set-backs and conditions definitely on the upgrade seems to represent the common opinion of tool dealers. For fully two months conditions have been improving slowly. Most dealers report July the best month of the year—most unusual for a summer month—and several report August better than July. Dealers report that prospective customers are holding up business until they can see actual orders of their own in sight. Leaders seem to feel that there will be no unusual spurt of business but that it will continue definitely to improve throughout the fall and early winter. Most orders now are for individual tools and single pieces of equipment.

In the electrical equipment field, business seems to show some improvement

CLEVELAND

Slight sales gains and increased inquiries for the past ten days has developed a more optimistic sentiment. There is a general feeling that the next four months will produce a better volume than any four months of the year. A general awakening of activity is expected soon in the automobile plants. Local parts manufacturers have received quotations on new tools. The Cleveland Board of Education is preparing a list of tools for three new high schools nearing completion. Local dealers are bidding on a $12,000 order of lathes and woodworking machinery for the Dayton Airport. Confirmed reports of the plans for the Addressograph-Multigraph Corporation for production in its new million-dollar Cleveland plant, indicate that this company is planning to move its entire tool equipment from Chicago, the purchase of new tools or re-tooling will be postponed until a production schedule is established.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

An old conundrum asks why Xantippe was a shrew. The answer is that Socrates might be a philosopher. This bit of humor was recalled by an announcement that most of the American booksellers report an improved demand for philosophical and biographical literature. This is reassuring, for the men and women who read philosophy are not easily led into wasteful speculation or extravagance. But the booksellers' announcement and the continued activity in the shoe and worsted trades are about the only affirmatively cheerful items in the economic news of last week, though the advent of Labor Day is relied on to bring the beginning of fall trade.

Observed superficially, the world seems to be in great disorder, and the statesmen and bankers who are attempting to straighten out the confusion have been kept very busy flitting from one financial capital to another. Down in Texas and in Oklahoma, an attempt to control the supply of oil by the use of an armed militia is attracting a good deal of attention, and many other less important attempts at price fixing are reported.

World Conditions

In Great Britain the Labor Party seems to have been split by the course that Premier MacDonald has chosen to follow in becoming the head of a coalition government. Austria and Germany have renounced their proposed customs union, coupling their renunciation with a request for broader and more fertile results from the European Union Commission. Syndicalist strikes have been terrorizing Barcelona, Spain, leaving the city in darkness. In Chile the Congress has declared a state of siege to enable the government to cope with an alleged "Red" insurrection, in which the navy is said to have joined the rebels. The floods in China seems to have taken all the fight out of the warring factions. In Brazil they have thus far burned up over a million bags of low-grade coffee in the hope that its destruction will advance the price of the unconsumed supply. Our American coffee merchants and flour millers are protesting bitterly against the Government's action in exchanging a large quantity of American wheat for coffee. In Germany the unrest continues. The opening of the Berlin Bourse on Thursday revealed a more drastic decline in values than had been expected. The French are about the only people in Europe who have not some sort of conference or international issue on their hands.

The stock market had another week of uncertainty, slumping to new lows for the movement on Thursday, but the averages were still comfortably above the lows reached in the first three days of June. In the commodity markets wheat dropped below 45c. on Thursday but did not stay there; rubber is further down; sugar has had a slight but unimportant decline; and coffee was beginning to hold up its head for a few minutes at a time, but on Thursday suffered a sinking spell. Cotton has also been trying to advance.

In this country the textile industry is undoubtedly doing better. This seems to be particularly true of New England, and some Southern mills are again running at night to the great discomfiture of their competitors. That the improvement has extended to practically all important branches of the textile industry is indicated by the rising trend of consumption of silk and the confident views of the immediate future expressed by rayon manufacturers.

Financial Outlook Attractive

To the individual American investor the financial outlook ought to be attractive, for it offers many bargains at prices that are undoubtedly cheap. Available facts seem to indicate that Great Britain and the Bank of England have succeeded in borrowing $600,000,000 in the United States and Europe, and that the United States Treasury has arranged loans aggregating $1,100,000,000. Of this amount $800,000,000 will be for 24 years at 3 per cent, and $300,000,000 for 12 months at 1½ per cent. These rates come very near to being the lowest at which the United States Government was ever able to borrow. This fact in itself ought to have some tonic value, but its effect may be delayed until the public is in a more appreciative mood and better able to sense the fortunate position in which the Secretary of the Treasury finds himself.

Meantime, winter is still three to four months away, and it may be that we shall see a change in the temper of the people before the first of December. Some wit has said that the present depression in business is due to overprediction rather than over-production, and many of the items published in the week's news would seem to justify this slap at our prophetic instinct and mistakes. Certainly it cannot be said that we went backward last week, and as the progress of humanity can never be stabilized, it seems safe to conclude that we are now going forward, even though our movement may be imperceptible to the naked eye. Therefore, and upon the general belief that commodities and securities are now on the bargain counter, those who have money to invest are urged to scan closely the price lists of the security market and the quotations current on the commodity exchanges.

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THE BUSINESS WEEK

September 9, 1931

Business apparently gave this August up as a bad job . . . The general level of production, construction and trade, as measured by our weekly index, averaged about 5% below July and by the end of the month fell to the lowest point of the depression . . . Securities markets showed reassuring ability to resist unfavorable news, but the business momentum which normally accumulates in August for fall activity was feeble . . . Steel production gave no indications of impending expansion in any line of demand, except possibly structural requirements for public works, the full force of which is being postponed by political inertia and stupidity . . . General building operations remained at low levels, and the usual seasonal rise in electric power and coal production, in commercial loans and bank debits was absent . . . The persistent slackness in merchandise carloadings suggests unusual delay in meeting fall retail trade requirements, perhaps because of a late Labor Day . . . The continued climb of currency outstanding, now above the $5 billion mark, punctuates the collapse of consumer confidence due to job insecurity, wage cuts and bank closings . . . The drastic decline in commodity prices, resumed in August, cannot coax these coy dollars back into circulation despite the dumb doctrines of deflation upon which our financial and fiscal authorities still insist and which are driving the world to universal debt repudiation or default . . . The "wait and see" school is still in the ascendancy, and signs of large-scale effort necessary to check the runaway process are still lacking.

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Material Trends and Prices . . . .

Structurals and pipe represent the principal elements of current trading in steel. Movement of iron is back to its level as of the autumn of 1921. All other lines of demand continue unduly sluggish for this season of the year. Prices remain dormant. Lead alone of the more commonly used non-ferrous metals, shows signs of buying activity. Prices of certain grades of belting, wiping materials and other shop supplies have declined sharply during the week.

(All prices as of Sept. 4, 1931)

IRON AND STEEL

Pig Iron—	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$11.00	$12.00	$14.00
Buffalo, No. 2, Fdry., per gross ton	17.00	17.00	15.90
Heavy Melting Steel Scrap—			
Pittsburgh consuming point, No. 1, per gross ton	10.25	10.50	15.60
Furnace Coke—Connellsville, per net ton	2.40	2.40	2.60
Foundry Coke—Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes—Pittsburgh, base, per 100 lb	1.60	1.60	1.60

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Iron Machinery Castings—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb:

Chicago.....4.62½ Cleveland.....4.50 New York.....4.75
Cincinnati.....4.40 Detroit.....4.00

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Steel Sheets—Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10*	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

* Light plates.

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Seamless Steel Tubing—Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

—Thickness— of Wall	Outside Dia. in Inches						
	½	⅝	¾	⅞	1	1¼	1½
Inches B.w.g.	Price per Foot						
.035 20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc.—Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel—Hot-rolled bars, base, Pittsburgh, 0.12 per cent carbon, cents per lb:

Chromium		Chromium	
15% and under	19.00	18 to 23%	23.00
15 to 18%	20.50	23 to 30%	28.00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots 73–10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:

Aluminum ingots, 99%, N. Y.	22.90
Copper, electrolytic, Conn	7.50
Copper wire, base, Chicago and Cleveland	9.87½
Copper wire, base, N. Y.	9.75
Lead, pigs, E. St. Louis	4.22½
Tin, Straits, pigs, spot, N. Y.	26.75
Zinc, slabs, E. St. Louis	3.80

Prices following are in cents per lb., base, N. Y., Chi. and Cleve:

Brass rods, high	13.62½
Brass sheets, high	15.37½
Brass tubing, high	20.25
Copper, drawn round	16.12½
Copper sheets	17.62½
Copper tubing	20.12½

Prices following are in cents per lb., del. from N. Y. warehouse:

Babbitt, anti-friction, general service	28.75
Babbitt, com'l, intermediate grade	34.50
Babbitt, genuine, highest grade	44.25
Solder, bar	20.00

Prices following are in cents per lb., base, Huntington, W. Va:

Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals—Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	3.00	4.25	4.00@4.25
Light brass	2.50	3.25	3.25@3.75
No. 1 rod-brass turnings	3.50	4.50	4.00@4.50
Heavy copper	5.50	5.75	6.25@6.75
Light copper	4.50	5.00	5.50@6.00

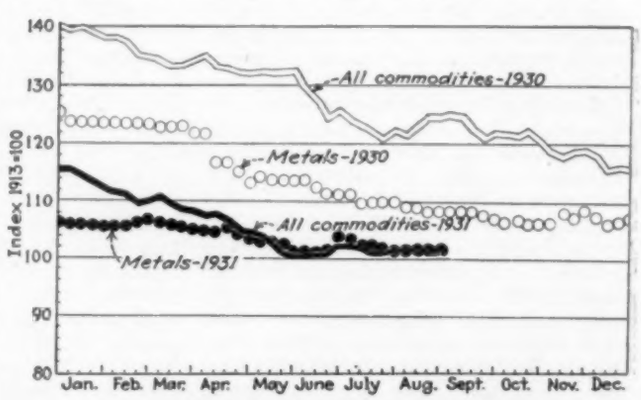
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide mineral, cloth, 6-in. dia., No. 1, less than 200, per 100	$4.36	$4.59	$4.59
Belting, leather, heavy, discount	30–10%	40%	40%
Belting, rubber, trans., 1st grade, discount	60–10–10%	60–10%	60%

Lumber—Per M ft., b.m., 16 ft. lengths, del., N. Y:

Crating—Southern pine:
1x4-in..... $27.00 1x6-in..... $26.00

Skids—Spruce:
2x4-in..$37.00 3x3-in..$46.00 4x6-in..$48.00 6x6-in..$52.50



Price Indexes Week by Week

(6 Metals and 74 Commodities—Figures from The Annalist.)

NEWS

Annual Safety Congress and Exposition Metals Industries Program

During the week of Oct. 12-16, delegates of the Metals industries will meet at the Stevens Hotel in Chicago to carry out a cooperative program planned to consider practical ways and means for the reduction of accidents and accident costs in these industries. This accident prevention program, as a part of the Twentieth Annual Safety Congress & Exposition, will be conducted by three different cooperative groups of the National Safety Council, the Metals Section, the Automotive and Machine Shop Section, and the Power Press Section. These three groups officially represent about 1,700 different industrial organizations which employ between two and three million workers. They include about one-third of the total membership of the National Safety Council.

The metals industries have been making encouraging progress in accident prevention. For example, 73 establishments that have been reporting each year for the past three years to the National Safety Council show a decline of 39 per cent in their accident frequency rates and 15 per cent in their accident severity rates. The accident frequency rate for the entire industry is 35 per cent below the average for all industries, but the accident severity rate of the industry is 25 per cent higher than for all industries. In the machinery industry 141 establishments which have been reporting for the past three years show a 14 per cent decline in accident frequency rates, but a considerable increase in accident severity rates.

The Metals Section program, in four half-day Congress sessions, will include "Analysis of Accident Causes in the Metals Industry"; "Hand Labor and Trucking"; "Good Eyesight Essential in Industry"; and "Good Housekeeping." One afternoon session will be devoted to the safety problems of the foundry, with an address on "Cleaning in the Metal Industry." There will be an educational film strip, and a motion picture showing the "Conveyorized Foundry System of the General Electric Company." Another session will feature "Outstanding Facts of the Metals Section Safety Contests and Award of Certificates."

The Automotive and Machine Shop Section will have three half-day session programs. Special topics will be "Human Engineering," "Is Accident Prevention the Employee's or Employer's Problem?" "Accident Prevention from the Viewpoint of an Executive," and "Safe Practices in Machine Shops." A program feature will be an address and discussion on "The Accident-Prone Employee." One session will be held jointly with the Power Press Section to consider the topic of "Recent Developments in Power Press and Machine Shop Guarding."

In the Power Press Section there will be "Trend of Accidents in the Power Press Industry," "Production With Safety in a Small Power Press Plant," "Is the Press Safe Because It Is Guarded?," "Safety in a Forge Shop," and "What Is an Efficient Power Press Department?"

A feature will be the annual Safety Exposition in the exhibit hall of the Stevens Hotel. More than 100 exhibitors will display a panorama of standard safety equipment, and latest developments in safety appliances.

Industrial Profits Decline 52 Per Cent

Since the publication last month *(AM* —Aug. 13, page 292j) of a preliminary tabulation of industrial corporation profits for the first half year, taken from the report of the National City Bank of New York, some two hundred additional reports have been tabulated, the revised figures applying to 555 companies. Combined net profits of the group, after deducting all charges but before dividends, amounted to approximately $406,000,000, as compared with $846,000,000 in the corresponding period of 1930 and $1,216,000,000 in 1929, representing declines of 52 and 67 per cent respectively. There were 173 companies, or 31 per cent of the total that reported deficits this year aggregating $120,399,000, while in 1930 there were 78 companies, or 14 per cent, having deficits of $45,180,000, which have been deducted in arriving at the totals. Annual rate of profits return averages 4.2 per cent of the $19,554,000,000 net worth at the beginning of the year, as compared with 8.8 per cent profit in 1930 and 14.8 per cent in 1929.

Net profits for machinery manufacturing companies are given as $4,623,000 for the first half of this year, as compared with $24,178,000 for a similar period in 1930, a percentage decline of 80.9. Net worth Jan. 1, 1931, was $451,158,000, as compared with $425,225,000 Jan. 1 last year, an increase of 6.1 per cent, while the annual rate of return is 2.0 per cent this year, compared with 11.4 last.

Machinery Industry Pictured as "Sick"

A picture of the machinery industry, "sick, subject to the severe fluctuations of the business cycle and in need of business experience and organization," was presented to the Stevens-Columbia economic conference Aug. 31 by W. H. RASTALL, chief of the industrial machinery division, United States Department of Commerce. In an address on "What Is the Matter with the Machinery Industry?" Mr. Rastall told his audience that the industry was is sore need of information and training on how to keep business at a peak, to handle seasonal factors and generally to raise the standard of management.

There was a strong question, the speaker declared, whether fluctuations in the machinery industry did not have a direct effect on the entire business cycle. Taking the year 1925 as an example, Mr. Rastall said that it was estimated then that every dollar spent for machinery was turned over six times. In that year equipment production of machinery was about $3,000,000,000. On the basis of the turnover cited this $3,000,000,000 represented really $18,000,000,000 — or enough to preempt twenty per cent of the total production of all industries, rated that year at $90,000,000,000.

Fluctuations in the machinery industry in 1921 and again in 1930, Mr. Rastall declared, were graphically mirrored in the fact the "forty-four per cent of the 10,000 machinery manufacturers have failed to show profits in the years between."

Shipbuilding Off In Summer Slump

The depression in ship construction, which made itself felt in American yards last spring, continued during the summer, carrying the totals to new low levels in number of hulls and tonnage of work under way, according to the bi-monthly report of the American Bureau of Shipping, covering conditions on Sept. 1. Thirty-one yards were at work on 124 hulls, representing a total of 354,686 tons, as compared with thirty-seven yards building 186 hulls of 412,626 tons two months ago, a decrease of 57,940 tons. The principal construction remains divided among five yards.

France Looks Forward With Distrust As Tool Exports Shrink

BY OUR PARIS CORRESPONDENT

A French authority, DR. PAUL WOHL, has defined the industrial prosperity of France as being based on machinery, metal transforming and transportation. French developments along these three lines have become of such importance since the war, as the result of heavy capital investments, that in view of the limited consuming power of the home market few plants have worked at capacity. Thus France is over-industrialized. The idea is gaining ground on all sides.

Without doubt the French economic, industrial and financial situation of the moment is entirely influenced by the state of affairs in Germany. It is hardly the moment to look for any special trade movements in advance, certainly not before some firm foreign policy is developed. Competition in seasonable lines both in home and foreign markets is making itself felt as seldom before.

Activities in the metal transforming trades are obviously handicapped by midsummer dullness. It has been stated by Monsieur Citroen that France will soon be independent of the United States and Germany for hard, polished steel sheets.

Automobile production and distribution, as elsewhere, leans toward the static side. The foundry industry is dull. The machinery and tool industries are all but inanimate, and shipbuilding is running on short time with smaller numbers on the pay-roll.

There is a rumor of railway rolling stock orders, already sketched in the rough, amounting to 200,000,000 francs and representing four million working days, being withdrawn, due to refinancing projects of the railways themselves and reduced government participation.

According to SEN. GASTON JAPY, himself interested in important metal transforming interests, France is the richest of all European countries in gold per inhabitant—$260. The average French tariff does not exceed 13 per cent ad valorem. "'Massive imports' of manufactured articles have at last come to trouble French economy," he says, "bringing in their wake not only a slowing down of French industry, but what is also important, a falling-off in government receipts from taxation which is so greatly contributed by industry."

Senator Japy is emphatically against a European customs agreement, claiming that it is but a Geneva concocted soporific which will put France to sleep but will awaken the energies of Great Britain, Germany and Japan, to say nothing of what he refers to as *"extra-European America."*

Following official figures of the first six months of the present year, French imports of machinery and motors have in almost every classification fallen one-half from what they were a year ago. Virtually the same applies to textile machinery, dynamos and transformers, shrunk in value from 108,677,000 francs to 80,016,000 francs. Radio equipment (omitting lamps), however, increased from 41,993,000 francs to 53,323,000 francs. Cable and wire for electrical transmission fell in various categories from a third to a half. Exports of similar goods showed even greater shrinkage. Imports from the United States fell off 1 billion francs in value, those from Germany 600 million francs, and from Great Britain 700 million francs.

Political relations between France and Germany apart, it is seemingly feared that a tacit acknowledgment will be granted German industry to dump its manufactures in France, as a result of the "understanding" between the Bruening cabinet during Monsieur Briand's visit in company with the French premier to Berlin.

The Franco-German commercial agreement, which bears so heavily on French machinery and allied trades, is also affecting the status of like American goods on the French market. French opinion is that with government subventioned industry in Germany, France has no available weapon with which to protect herself. Senator Japy, in his discourse before the closing of parliament, stated that it was an avowed policy of Germany to offer its manufactures on the French market with only labor and raw material charges computed, leaving nothing added for overhead, and little in the way of taxation of the kind which France has loaded on to her industrial enterprises. In addition German manufactures going to France on reparations account benefit from 40 per cent tariff discount.

French industry is protesting, too, against the new Spanish customs reductions of 15 to 50 per cent on "unmounted automobiles" and agricultural machinery parts as affecting seriously French trade in the peninsula. It is suggested that United States makers have again found a way of peaceful penetration into world markets.

Unemployment is still increasing, though in no such measure as yet as would bring France into the lists with England and Germany. The government labor office for the Paris district reported the last week of July, 50,547 seeking employment, an increase of 2,000 over the week before. The mechanical trades in the same region had only 63 jobs to offer among 6,702 seeking work in this branch. During the same week the ministry of labor stated that 1,725 foreign workers entered France. In the Haut-Rhin department, an important metal fabricating center, but 30 per cent of the workers in 16 plants were employed at full time, reductions running from 5 hours to 16 hours per week.

Farm Implement Exports

Almost 75 per cent of American exports of farm implements in 1931 have gone to Soviet Russia, according to a survey of Moody's Investors' Service. During the first six months of this year, Russia took farm machinery valued at $37,216,000, or 74.3 per cent of these United States exports, while Canada and Australia together took less than 10 per cent.

Milling brake parts at a rate of 955 per hour, using automatic clamp-and-release workholders at two elevations, one for passenger car parts, the other for truck parts. The machine is an Oesterlein using the offset milling process

Management Association Marketing Conference

The program for the Industrial Marketing Conference of the American Management Association at Cleveland, Oct. 21-23, has been announced to include the following papers: "Product and Market Research"; "Defining and Locating the Buyer and the Line of Buying Influence"; "The Use of Engineering Service in Selling" (by RAYMOND S. PERRY, vice-president, Ingersoll Milling Machine Co.), "Industrial Sales Budgeting Coordinated with Potential Market and Sales Analysis", "Statistical Data Needed in Measuring Market Demand", "Using Salesmen in Industrial Market Analysis", "Instalment Selling of Industrial Equipment", "Developing an Industrial Sales Pricing Policy", "Determining Whether or Not to Sell Direct or Through Dealers or Agents"; "Effective Methods of Convincing Industrial Buyers to Modernize Equipment and Methods", and "Selling to Industry Abroad."

On March 7, 8 and 9, 1932, the A.M.A. will hold a packing conference anl clinic and a consumer marketing conference at the Palmer House, Chicago, and a Packaging, Packing and Shipping Exposition, a broadening of the Packaging Exposition held in New York City in May of this year.

July Auto Output Lowest in Months

Automobile production in the United States in July, amounting to 218,961 cars, was the smallest for any month this year with the exception of January, according to figures issued by the Department of Commerce. It represented a decline of 31,696 vehicles below that of June, when 250,657 were produced. Declines were shown in all lines, passenger-car production dropping to 182,927 in July from 208,955 in June, trucks to 35,854 in July from 41,342 in June and taxicabs to 180 from 360 in June. The taxicab figure was the lowest in recent years.

The combined production of all classes of vehicles in July compared with 265,533 in the corresponding month last year and 500,840 in July, 1929. The July output of passenger cars and trucks were both above the low level of last January, when the production of passenger vehicles was 137,805 and trucks 33,531.

Nitralloy Establishes Demonstration Center

The Nitralloy Corporation, 230 Park Ave., New York, N. Y., which owns and/or controls various patents for the process of nitriding, composition of alloy steels and cast irons, etc., has joined with the Electric Furnace Co., Salem, Ohio, and the Commercial Steel Treating Co., Detroit, Mich., in the erection and operation of a demonstration nitriding center at the plant of the latter, 6100 Tireman Ave., Detroit, Mich. The furnace is of the electrically heated, semi-continuous, horizontal type with three nitriding boxes provided with forced gas circulation. The largest box is 60x18x18 in., the two smaller being 19½x18x18 in. It is hoped that the demonstration plant will aid in obtaining economies heretofore difficult to obtain and at the same time turn out a uniform and satisfactory product, as well as promoting further research and development work.

S.A.E. Plans Several Programs

This year the S.A.E. is cooperating with other engineering societies by having a technical session at the National Metal Congress in Boston in connection with an exhibition during the week Sept. 21 to 25. The Society will hold its technical session in the Georgian Room of the Hotel Statler on Wednesday morning, Sept. 23, at 9:30 o'clock. F. P. GILLIGAN, chairman of the Iron & Steel Division of the S.A.E. Standards Committee, will preside. The program of the session comprises three papers, two of which deal with the methods and costs of heat-treating. One is to be presented by E. F. DAVIS, metallurgist of the Warner Gear Co., and the other by DR. HAAKON STYRI, of S.K.F. Industries, Inc. The third paper, to be read by F. W. SHIPLEY, foundry metallurgist of the Caterpillar Tractor Co., is devoted to the metallurgical characteristics and advantages of alloyed cast irons, particularly for use in cylinder castings.

The technical program for the tenth annual production meeting to be held at the Book-Cadillac Hotel, Detroit, Oct. 7 and 8, includes these papers: "Welding" by J. W. MEADOWCROFT, "Inventory Control" by C. P. STIFFLER. "Cleaning and Preparation of Metal Surfaces" by F. P. SPRUANCE, "Hot Coining" by J. H. FRIEDMAN, "Economic Advantages of Permanent Molding" by J. L. DOSTALL, and "Electrons at Work and at Play" by PHILLIPS THOMAS.

Simplified Practice

Signed acceptances have been received from a sufficient number of producers, distributors, users and other interested in the simplification of packaging of overhead electric railway equipment, to insure the general adoption of the program by the industry as a whole. Simplified Practice Recommendation R65-31 may therefore be considered effective forthwith.

Labor 32% of Value

Possibility of misunderstanding or misinterpretation of the statistics of manufactures recently published by the U. S. Bureau of the Census is pointed out by the National Industrial Conference Board in its monthly bulletin. In many recent articles and addresses in connection with the controversy over wages it has been stated that labor represents only 17 per cent of the value of the finished products of manufactures. This statement is true of the gross value reported by the Bureau of Census, but it ignores the fact that this "gross value" contains many duplications. It is not true if related to the finished product as delivered into the hands of the ultimate consumer. Actually, wages and salaries constitute 32.6 per cent of the value of the net product to the non-manufacturing consumer.

Freight Loading Again Increases

Loading of revenue freight for the week ended Aug. 22 totaled 748,711 cars, an increase of 5,975 cars above the preceding week but a decrease of 191,847 cars below the corresponding week last year. It was also 389,255 cars under the same week two years ago.

Worthington Pump Makes Appointments

During the past several weeks, several additions have been made to the staff of the Worthington Pump & Machinery Corp., 2 Park Ave., New York, N. Y. At the same time, certain organization changes have been made. OTTO NONNENBRUCH, for the past four years chief engineer of the Diesel department, I. P. Morris & DeLaVergne, Inc., Philadelphia, Pa., and prior to that with Worthington in various capacities for nine years, rejoined the latter organization as of July 1. He will make his headquarters at Buffalo, N. Y., as special sales representative there. J. B. ALLEN, formerly president of the Allen Engineering Co., Bridgeport, Conn., and prior to that with the Sperry Gyroscope Co., Brooklyn, N. Y., has been appointed special marine representative with headquarters at Harrison, N. J. H. G. WOOD, formerly assistant manager of the New England division of the Westinghouse Engineering & Mfg. Co., has joined Worthington as an electrical sales engineer. E. M. PAULLIN, JR., has been appointed electrical sales engineer at the Cincinnati (Ohio) works of Worthington. He was formerly associated with the General Electric Co.'s New York office as synchrouous motor specialist.

JOHN T. CLANCY, assistant manager, Buffalo works sales division, has transferred his headquarters from Buffalo to Harrison, N. J. E. W. HAMMOND,

formerly at Buffalo, has been transferred to Los Angeles as special representative of Diesel and gas-engine sales on the Pacific Coast. A. M. BOEHM goes to Kansas City as Diesel and gas-engine specialist. He was formerly in the Buffalo works sales department. JOSEPH F. HECKING, formerly with the Diesel engine sales division in New York, has been assigned to the Diesel and gas-engine sales division at Buffalo. WILLIAM J. DALY, assistant manager, Cincinnati works sales division, has been assigned to Pittsburgh, Pa. on special sales work. G. A. HERRMANN formerly sales engineer at Chicago, has been appointed acting district manager at St. Paul. W. R. KENNEDY, sales engineer at Pittsburgh, has been appointed acting district manager at Kansas City.

BUSINESS ITEMS

The Farrel-Birmingham Co., Inc., Ansonia, Conn., has opened a new office in Chicago at 1059 First National Bank Bldg., Monroe & Clark St., in charge of HARRY TEMPORAL, who was transferred from the Akron office. Mr. Temporal has been a sales representative of the company for 21 years. The Akron office, in charge of ANDREW HALE, has been removed from the United Bldg. to 2710 Central Depositors Bank Bldg.

The Gabriel Co., Cleveland, manufacturer of automotive equipment, has announced that its Class B shares have been acquired by a group of New York, Baltimore and Montreal business men. New officers are W. H. JOHNSTON, president; GEORGE H. RALLS and J. H. SHOEMAKER, and JOHN J. BATTERMAN, vice-presidents; B. LYTTON JOHNSTON, secretary and treasurer, and DAVID BENJAMIN, assistant secretary and assistant treasurer. Mr. Ralls, who has been with the company since 1923 and has been president since 1926, is vice-president and general manager.

The Minneapolis-Moline Power Implement Co., Hopkins, Minn., with factories at Hopkins and Minneapolis, Minn., and at Moline, Ill., has begun the manufacture of a free-wheeling transmission unit as an addition to its line of automotive machinery and equipment. The free-wheeling unit is manufactured for the Advance Motor Co., 69 Thirteenth St., South, Minneapolis.

Representatives of Motch & Merryweather, Chicago, and Marshall & Huschart, Detroit and Cleveland, new dealers for the Kearney & Trecker Corp., Milwaukee, were guests of the firm Sunday and Monday, Aug. 30-31.

The City Machine & Tool Works, Dayton, Ohio, recently received two of the largest single orders ever placed for gear chamfering and gear burnishing machines. The orders, received from prominent automotive manufacturers comprise 34 machines, each being for 17 complete machines.

Incorporated as an extra-provincial company, the Mill Engineering & Supply Co., 3311 First Ave. South, Seattle, Wash., has been registered at Victoria, B. C. The Vancouver offices of the firm, which carries on business as manufacturers of and dealer in machinery, engineering equipment and supplies, are located at 551 Howe St.

The Dayton-Rogers Mfg. Co., 1114 So. Third St., Minneapolis, Minn., which is now manufacturing stamped blanks in small lots without the usual standard blanking dies, has appointed A. L. WHITTEMORE, 15 No. Jefferson St., Chicago, Ill., as district sales representative.

Swart & Trampusch, 305 E. 45th St., New York City, sole American agents for the Bekk & Kaulen Offset deep-etch process, have moved their offices to 461 Eighth Ave., Printing Crafts Bldg., New York City.

The National Acme Co., Cleveland, Ohio, and Windsor, Vt., has entered into a license agreement with the Dardelet Threadlock Corporation, 120 Broadway, New York City, to manufacture, use, and sell bolts, nuts, and screw machine products threaded with the Dardelet self-locking screw thread.

PERSONALS

GEORGE A. BAUSMAN, for 12 years treasurer of the National Equipment Co., Springfield, Mass., has been elected president to succeed COL. O. S. LYFORD of New York, who had held the office since last February.

W. C. BRUTON, for many years sales engineer working from the Oakland, Calif., office of the American Manganese Steel Co., Chicago Heights, Ill., has been appointed district sales manager for the Pacific Northwest Territory, comprising Oregon, Washington, British Columbia, and the Coeur d'Alene district in Idaho, with offices at 411 Coleman Bldg., Seattle, Wash.

H. J. BEACH, with the Flexible Steel Lacing Co., Chicago, Ill., for the past 19 years, has been elected president to succeed the late P. S. RINALDO. Other officers are: M. B. BEACH, vice- presipent; H. L. COATES, secretary and director of sales; P. S. RINALDO, JR., treasurer; and J. C. OLSEN, assistant secretary and director of production.

R. M. BEAN, Syracuse, N. Y., has bought a one-half interest in the Revere Products Corp., Phoenix, N. Y., and has been elected secretary, treasurer and a director of the corporation, which manufactures metal stampings for automotive and other uses.

LYMAN H. BELLOWS, formerly sales manager of the automotive maintenance division, Arco Co., Cleveland, Ohio, has become manager of the Cleveland office of the Stanley Electric Tool Co., New Britain, Conn.

JOHN H. BERRY, formerly production manager of the General Motors Export Co., Japan, now occupies a similar position with Vauxhall Motors, Ltd., Luton, Bedfordshire, England.

FRANCIS BRADLEY, formerly general superintendent of the Midvale Co., Nicetown, Pa., has been elected vice-president in charge of operations to succeed DR. HARRY L. FREVERT, who has been elected president to succeed the late ALVA C. DINKEY.

HERMEN H. BRIEN, formerly associated with the Belle City Malleable Iron Co., Racine, Wis., and the Dayton Malleable Co., Dayton, Ohio, is leaving early this month for Russia, where he has a one-year contract with the Soviet as superintendent of the malleable iron division of the Kharhov tractor plant in the Ukraine.

CLARE WESLEY BUNCH, formerly engineer and Wichita branch manager of the Pioneer Instrument Co., Brooklyn, N. Y., is now located at Linn Creek, Mo.

HAROLD E. BUTCHER, formerly vice-president and director of sales of the Edward G. Budd Mfg. Co., Detroit, has severed his connection with that company. His present address is Hawthorne Road, Ottawa Hills, Toledo, Ohio.

H. E. CHILCOAT, who since September, 1928, has been sales manager of the air dump car department of Koppel (Pa.) Industrial Car & Equipment Co., has been appointed general sales manager. For two years prior to going with the company, Mr. Chilcoat was engaged in consulting commercial engineering work. He joined the Pennsylvania railroad in 1900, and after six years left to go with Westinghouse Air Brake Co., Wilmerding, Pa., and later, for a time, he was with the Clark Car Co.

JOHN COAPMAN, formerly a sales representative of the Timken-Detroit Axle Co. is now connected with the Motor Wheel Corp., Lansing, Mich.

TRUSTEN P. DRAPER, vice-president in charge of operations, Sharon (Pa.) Steel Hoop Co., has retired, and his duties have been assumed by other officers under the general direction of JOHN A. ROEMER, president.

CHARLES M. GEARING, division manager, Meriden (Conn.) plant and member of the directorate of the New Departure Mfg. Co., Bristol, Conn., has been appointed general works manager, with headquarters at Bristol. His duties will include general supervision of production in all three plants, Bristol, Meriden and Hartford.

WILLIAM F. JENNINGS, president and treasurer of the Bound Brook Oil-less Bearing Co., has been elected president of a subsidiary company recently organized under the name of the Fischer Foundry Corp., Bound Brook, N. J., to manufacture a full line of bronze and aluminum castings.

J. FRED MEHLHOPE has been appointed Chicago district sales manager for the Newton Steel Co., Detroit, with offices at 724 Straus Bld., 310 So. Michigan Ave.

EDMUND E. BURKE, for the past eight years on special sales and engineering work for the Kent-Owens Machine Co., Toledo, Ohio, has been made sales manager, covering both divisions of the company's operations. He will have charge of the projected development program. A Special Service department has also been inaugurated, under the leadership of HAROLD STEVENS.

A. M. JONES, for 33 years with the General Electric Co., Pittsfield, Mass., retired Sept. 1 on a pension. He was a pioneer at that plant, rising from punch press operator to superintendent of the largest manufacturing division of the works, the power transformer department.

ERNST VON MERTENS has become assistant superintendent of the Apollo Magneto Co., Kingston, N. Y.

HAROLD L. POPE has become assistant to the president of the Northwestern Leather Co., Sault Ste. Marie, Mich.

WALTER C. ROBBINS, formerly vice-president in charge of engineering and manufacturing of the Gabriel Co., Cleveland, Ohio, has become vice-president and general manager of the Thermo Hydraulic Shock Absorber Co., Cambridge, Mass.

A. M. ROOD has been made manager of the Dallas (Tex.) branch of the Massey-Harris Co., Racine, Wis. He has been acting manager there since the resignation of E. L. WOODS.

F. C. RYAN has been appointed sales manager of the Newark (N.J.) Wire Cloth Co. He was formerly sales engineer with the New Jersey Zinc Co., and more recently was staff manager with the Johns-Manville Sales Corp.

T. G. STEWART, formerly foundry superintendent of the J. I. Case Co., Racine, Wis., has left for Russia where he is under contract with the Soviet as superintendent of the entire Kharkov tractor works.

HERB L. WHARTON, formerly with the Shilling Foundry & Machine Co., Columbus, Ohio, has been made general superintendent of the Marathon Foundry & Machine Co., Wausau, Wis.

P. S. WILLIAMS, until recently general factory manager of the Hall-Scott Motor Car Co., Berkeley, Calif., has become general manager of the Merco Nordstrom Manufacturing Co., Oakland, Calif.

OBITUARIES

WILLIAM A. BARNARD, 86, until 3 years ago vice-president of the William Schallhorn Co., New Haven, Conn., and inventor of a number of mechanic's tools, died Aug. 24.

HERBERT L. DEININGER, 54, for the past 18 years in charge of the experimental department, Cincinnati (Ohio) Ball Crank Co., died there Aug. 31.

JOHN F. FIERKE, 71, for more than 50 years associated with the Illinois Iron & Bolt Co., Carpentersville, Ill., of which he had been president and general manager 22 years prior to his retirement last year, died Aug. 27.

JOHN F. GARRETT, 42, foundry manager, Armstrong Mfg. Co., Springfield, Ohio, died recently there.

FRANK F. GORHAM, manager of the maintenance department of the Yates-American Machine Co., Beloit, Wis., with which he had been identified for the past 31 years, died at Lake Mills, Wis., recently, on a vacation.

ABRAM GROSS, secretary-treasurer, Spring City (Pa.) Foundry Co., died Aug. 19, at Atlantic City.

FRED H. HAMMILL, 59, formerly vice-president of the Rock Island Lines, who retired two years ago, died Aug. 30 at his home in Chicago.

REUBEN HITCHCOCK, 57, president of the Cleveland (Ohio) Stoker Co., died at Kirtland, Ohio, Aug. 29.

MAJ. WILLIAM M. HOGG, 56, assistant to the vice-president of the National Tube Co., Pittsburgh, died at Edgewood, Pa., recently. He had been with the company for the past 12 years.

H. O. LANGE, 76, president of the Ferguson & Lange Foundry Co., Chicago, Ill., died Aug. 25.

HAROLD A. LINDAHL, 34, vice-president of the Henry Lindahl Foundry & Machine Co., Chicago, Ill., died Aug. 31 after an illness of several months. Mr. Lindahl had been secretary of the company until the death of his father, HENRY LINDAHL, about a year ago, when he became vice president, and his brother, FRED H. LINDAHL, became president. He spent all his business years with the company his father founded about 35 years ago.

ALFRED HENRY MULLIKEN, 77, formerly for 30 years president of the Pettibone Mulliken Co., Chicago, Ill., one of the largest makers of railroad supplies in the world, died suddenly Sept. 2, in New Canaan, Conn.

During the World War Mr. Mulliken was a committee of one at Washington, representing all the frog and switch manufacturers in the United States, fourteen concerns in all, in their relationship with the government. He retired in 1928.

PAUL F. SCHRYER, general manager, works department, International Harvester Co., Milwaukee, Wis., died Aug. 21, at his summer home. He had been with the company all of his businss career.

HARRY OWENS GALE, 73, salesman for Henry A. Kreis & Sons Co., Baltimore, machinist and dealer in mill supplies, died suddenly Aug. 27. Mr. Gale's death occurred the day following the funeral of Henry A. Kreis, president of the concern, who was similarly stricken while enroute to Atlantic City.

MEETINGS

NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION
Annual meeting, Hotel Commodore and Association headquarters, 420 Lexington Ave., New York City, Sept. 16.

STEEL FOUNDERS' SOCIETY OF AMERICA, INC.
First fall meeting, Chicago, Sept. 17. Granville P. Rogers, managing director, 932 Graybar Bldg., New York, N. Y.

NATIONAL METAL CONGRESS AND EXPOSITION
Exposition on Commonwealth Pier and Congress sessions at Hotel Statler. Boston. Mass., week of Sept, 21. Meetings of A.W.S., A.S.M.E.. A.I.M.E., and American Society for Steel Treating in connection. Information from W. H. Eisemann, secretary A.S.S.T.. 7016 Euclid Ave., Cleveland, Ohio.

SOCIETY OF AUTOMOTIVE ENGINEERS
National production meeting. Detroit, Mich., Oct. 7-8. John A. C. Warner, secretary, 29 W. 39th St., New York.

SOCIETY OF INDUSTRIAL ENGINEERS
Annual meeting, Pittsburgh. Pa., Oct. 14-16. George C. Dent, secretary. 205 W. Wacker Drive. Chicago. Ill.

NATIONAL SAFETY COUNCIL
Twentieth Annual Safety Congress, Chicago, Ill., Oct. 12-16. W. H. Cameron. secretary, 20 North Wacker Drive, Chicago.

GRAY IRON INSTITUTE
Fourth annual convention. West Baden Springs Hotel, West Baden Springs Ind. Oct. 15-16. J. Arthur Tuscany secretary, Terminal Tower Bldg.. Cleveland.

AMERICAN MANAGEMENT ASSOCIATION
Industrial marketing conference, Hotel Statler, Cleveland, Ohio, Oct. 21-23. Headquarters, 20 Vesey St., New York. N. Y.

STEEL FOUNDERS' SOCIETY OF AMERICA, INC.
New York meeting. Oct. 22. Granville P. Rogers, managing director. 932 Graybar Bldg.. New York, N. Y.

SOCIETY OF AUTOMOTIVE ENGINEERS
National transportation meeting, Washington, D. C., Oct. 27-29. John A. C. Warner. secretary, 29 W. 39th St., New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION
Annual convention. New York. N. Y.. Nov. 17-19, devoted to the general theme of Coordinated Industrial Planning. Headquarters, 20 Vesey St., New York, N. Y.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS
Annual meeting, Engineering Societies Bldg., New York, N. Y., Nov. 30-Dec. 5. Calvin W. Rice. secretary, 29 West 39th St.. New York. N. Y.

FIRST NATIONAL EXPOSITION OF MECHANICAL HANDLING EQUIPMENT
Grand Central Palace. New York, N. Y., Nov. 30-Dec. 5. Charles F. Roth. secretary. Grand Central Palace, New York, N. Y.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Calif., Vallejo—Vallejo High School District, plans the construction of a group of high school buildings including vocational training shop, etc. Estimated cost $230,000. Davis-Pearce Co., Builders Bldg., Stockton, Archt.

Del., New Castle—Intercontinental Pipe & Mining Co., 122 East 42nd St., New York, N. Y., postponed reconstructing and re-equipping plant here. $1,000,000. Maturity about Dec. 1. Noted Apr. 30.

Georgia—Dept. of Forestry & Geological Development, Capitol Bldg., Atlanta, plans the construction of a pulp and paper mill, location not determined. Estimated cost $70,000. C. H. Herty, 101 Park Ave., New York, Archt. Maturity soon.

Fla., Panama City — Southern Kraft Corp., subsidiary of International Paper Co., 100 East 42nd St., New York, N. Y., has work under way on superstructure of storage and distribution buildings 1 story each for paper mill. Estimated cost $60,000.

Ia., Breda—Loxtercamp & Stallman, awarded contract for a 1 story, 50 x 80 ft. addition to garage. Estimated cost $12,000.

Ia., Burlington — Oscar Weinrich, awarded contract for a 1 story, 50 x 78 ft. factory. Heinlin-Hine Mfg. Co., manufacturers of passenger and freight elevators, lessee.

Ia., Sidney—Iowa State Highway Commission, L. M. Martin, Dist. Engr., Council Bluffs, will receive bids until Sept. 11, for the construction of a maintenance garage here.

Mass., Brighton (sta. Boston) — Dept. of Public Buildings, Boston, awarded contract for the construction of a 1 story garage at Police Station 14, on Washington St. here. Estimated cost $40,000. Noted July 23.

Mass., Nantucket—J. M. Cadrain, 7 Middle Pearl St., awarded contract for a public service and repair garage, etc. at Beach and Easton Sts. Estimated cost $45,000. Noted Mar. 19.

Mass., West Springfield — Strathmore Paper Co., L. Howes, Ch. Engr., Mitteneague, had plans prepared for a 2 story print plant here. Estimated cost $50,000. Private plans.

Minn., Hastings—H. W. Austin, Purch. Comr., Dept. of Administration and Finance, 10 State Capitol, St. Paul, will soon receive bids for a garage at state asylum. C. H. Johnston, 360 Robert St., St. Paul, Archt. Work will be done by inmate labor.

Minn., Minneapolis — Board of Education, G. F. Womrath, Bus. Supt., 305 City Hall, will receive bids until Sept. 18, for the construction of first unit of vocational school at Third Ave. S. and Eleventh St. Estimated cost $400,000.

Mo., Kansas City—City awarded contract for the construction of a group of buildings including 120 x 400 ft. hangar, 50 x 400 ft. leanto, 40 x 120 ft. testing building and 40 x 170 ft. office at Municipal airport. Estimated cost $250,000. Noted Aug. 27.

Mo., St. Louis—Board of Public Service, 208 City Hall, will receive bids probably in fall for the construction of a 5 and 6 story, hospital for Negroes to include service building, shops, etc. at Kennerly Ave., Whittier St. and St. Ferdinand and Goode Aves. Estimated cost $900,000. A. Osburg, 301 City Hall, Archt. L. R. Bowen, 301 City Hall, Engr.

N. J., Absecon—Metal Edge Fiber Products Co., awarded contract for a 2 story, 50 x 150 ft. factory at Ohio Ave. between Mill Road and New Road. Estimated cost $40,000.

N. J., Allwood—Ballinger & Co., 12th and Chestnut Sts., Philadelphia, Pa., Archts. & Engrs., will receive bids until Sept. 14 (extended date) for alterations to plant here for American Colortype Co., 207 West 25th St., New York, N. Y. Estimated cost $40,000. Noted July 30.

N. J., Bordentown—Dept. of Institutions & Agencies, State Office Bldg., Trenton, is receiving bids for two industrial buildings, each 2 story, 35 x 185 ft. and 35 x 268 ft. at New Jersey State Prison Farm here. Estimated cost $250,000. Division of Architecture & Construction, State Office Bldg., Trenton, Archt. Noted Sept. 3.

N. J., Englewood—Bd. of Education, 11 Engle St., will not construct 2 story vocational school. $150,000. Project abandoned.

N. J., Jersey City—Culvert Pipe & Fittings Co., 170 8th St., postponed construction of a 1 story, 150 x 200 ft. storage warehouse and distribution plant on Tonnele Ave. Estimated cost $150,000. Mahnken & Schultz, 26 Journal Sq., Archts. Will not award contract until next May.

N. J., South Amboy—United Lead Co., plans the construction of a 2 story factory. Estimated cost $40,000. Architect not selected.

N. Y., Brooklyn—Bella Finkel, 1936 78th St., plans the construction of a 100 x 260 ft. service garage at Utica Ave. and Lenox Road. Estimated cost $50,000. M. J. Ort, 424 East 149th St., Archt.

N. Y., Jamaica—Kalbert Bros., 26 Court St., Brooklyn, plans the construction of a 2 story service garage, etc. at Jamaica Ave. and 149th St. Estimated cost $100,000.

N. Y., New York—Salvatore Cincelli, 2393 Arthur Ave., will build a service garage at Hoffman and 184th Sts. Estimated cost $40,000. M. W. Del Gaudio, 545 5th Ave., Archt. Work will be done by separate contracts. Noted Aug. 20.

N. Y., New York—Dumont Electric Co., 42 West 17th St., leased space at 453 Broome St. for electric parts and equipment works and will make miscellaneous purchases and alterations.

N. Y., New York—National Screen Service Inc., 126 West 46th St., will award contract about Oct. 1 for the construction of a 7 story, 98 x 100 ft. factory and office at 346 West 40th St. Estimated cost $250,000. Berlinger & Kaufman, 232 Madison Ave., Archts. Noted July 30.

O., Girard—Ohio Leather Co., awarded contract for addition to leather plant. Estimated cost to exceed $40,000. Noted Aug. 27.

O., Toledo—International Harvester Co., 606 South Michigan Ave., Chicago, Ill., awarded contract for a 2 story branch plant and storage building. Estimated cost to exceed $150,000.

Ore., Portland—Portland Battery Mfg. Co., East 17th and Tacoma Sts., plans a 1 story, 100 x 500 ft. factory for the manufacture of electric storage batteries, battery plates, etc. Estimated cost $100,000. J. W. DeYoung, 350 Salmon St., Archt.

Pa., Ambridge—Spang Chalfant & Co. Inc., Clark Bldg., Pittsburgh, awarded contract for the construction of a 1 story, 125 x 500 ft. experimental electric weld pipe mill here.

Pa., Pittsburgh—Norton Co., O. Anderson, Mgr., 328 3rd Ave., manufacturers of grinding wheels, will soon award contract for the construction of a 1 story, 21 x 41 ft. garage and 3-story, 70 x 100 ft. warehouse and office on Carson St., Ballinger Co., 105 South 12th St., Philadelphia, Archt. and Engr.

S. D., Buffalo—Dehlinger & Sacrison, plans the construction of a 1 story, 50 x 100 ft. repair and service garage. Private plans.

Tex., Duncan Field—A. F. Dershimer, Constructing Quartermaster, deferred taking of bids to have been opened Aug. 31 for the construction of a 458 x 572 ft. engineering shop and utilities building. Estimated cost $400,000.

Tex., Amarillo—H. English, has work under way on a 1 story, 50 x 140 ft. machine shop. Estimated cost $21,000. Bery & Hatch, Oliver Eakle Bldg., Archts.

Va., Hopewell—Restwell Mattress Co., J. E. Leggan, Norfolk and Portsmouth, Va., plans the construction of a factory here. Estimated cost $40,000. Maturity indefinite.

Wash., Seattle—National Steel Construction Co., 425 Frontenac St., plans to rebuild iron and steel works destroyed by fire. Estimated cost $75,000.

Wis., Cumberland—Cumberland Body Works, A. Keeler, Prop., awarded contract for a 1 story, 50 x 50 ft. shop building.

Ont., Windsor—Packard Motor Car Co., 1580 East Grand Blvd., Detroit, Mich., acquired a building here for a branch assembly plant. Estimated cost $100,000 including equipment.

Equipment Wanted

N. Y., New York—R. J. Dooling, Commissioner of Purchase, Municipal Bldg.,—will receive bids until Sept. 14 for furnishing and delivering tools, implements and machinery for Departments of Parks-Queens, Sanitation and Water Supply, Gas and Electricity.

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